The Chemical Age

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Notes and Comments

Irish Developments

THE lack of commercial development in Ireland has been one of the predominant factors in causing unrest in that "distressful country." Northern Ireland is more happily situated than in the South, and there can be little doubt that the Irish Free State has a hard furrow to hoe to increase the wealth of her people and so to make them more contented. Poverty may well have been the root of the Irish problem. The formation of a Free State Industrial Research Council was consequently a master-stroke and one which can only receive the fullest approval. The first report of this body has now been issued and is primarily concerned with the utilisation of two of Ireland's principal possessions—peat and seaweed. The almost complete absence of coal must hinder any commercial development unless peat can be used. The difficulties connected with the drying of a material which may contain 90 per cent. of water and which even when thoroughly air-dried still has 30 to 40 per cent. render it doubtful whether the importation of coal can be avoided. In that respect, however, Ireland is no worse off than many other countries, for example, Italy.

A committee is, however, investigating the design of domestic stoves, cooking and open ranges and industrial boilers to ascertain which can best use the native peat as fuel. A further research is designed to regard peat as a raw material for a chemical industry, and attempts are being made to develop a commercial process for extracting from peat waxes suitable for industrial use. Another research is directed to the possibilities of using the cellulose and other organic matter in seaweed.

The Chemical Industry's Opportunity

ANOTHER material to be found in the Free State is clay. There is, for instance, a deposit at Portacloy which has been found suitable for pottery manufacture. In the process of winning and refining this clay, large quantities of silica sand are recovered as a by-product; it is hoped that this sand can be used for glass-making, but these possibilities are still under investigation. There is also a deposit of colloidal clay now being worked commercially at Cloyne for use as one of the constituents of foundry sand. It is hoped to use this and a neighbouring deposit of silica not only for foundry purposes, but also for other industrial applications such as paper filters, gramophone records and rubber manufacture; the research has not as yet been brought to a successful conclusion. The Irish Free State can be congratulated upon applying to its own particular problem the dictum of a British scientific report to the Commissioner for the Distressed Areas that: "General prosperity in these parts will be impossible without an extensive application of scientific methods to those industries which the local raw materials and situation make possible." There can be little doubt that Mr. de Valera, as a former University Professor, will be fully alive to the necessity for scientific control and ultilisation and to the advantages that will accrue from careful and continued scientific research upon these lines. It is perhaps just here that the British chemical industry might be of assistance in enabling this most recently born dominion to become self-supporting.

The provision of adequate capital, the direction of enterprises in Ireland and the opening of chemical works for the utilisation of local raw materials are all directions in which the Free State Government may well be anxious to secure British co-operation. If Ireland can be made self-supporting in any direction we may be sure that the Irish Government will do its utmost to avoid importations of those goods. Therein lies the advantage of British concerns opening branch factories in Ireland which could use largely Irish labour and from which manufactured goods might be sent to other countries.

The German Situation

MEANWHILE, although Italy and Abyssinia occupy first place in the news, the situation in Germany is not improving. It is strange in one sense that a country which is obviously facing such severe economic difficulties has chosen this moment to throw out the Jews whom history shows to be, as a people, the financial geniuses of the world. Rearmament has set Germany to work and, in Dr. Schacht's words, "has nearly abolished unemployment." Although the improvement in employment is certainly there, it has not been so great this year as last. The difficulty is that employment due to rearmament is not economically sound, for it is used in making goods that cannot add to the wealth of the country. The industries that have profited are those of iron and steel and other metals, machinery and building. Military barracks are springing up everywhere and this is responsible for a great increase in public building, and in the sales of building materials.

Coal does not seem to have benefited as much as would have been expected since miners have been poorly employed and the Government is preparing a plan for equalisation of work in the collieries. In

spite of all this activity in certain industries, the production of goods for consumption is not flourishing, the total improvement in that line being only 3 per cent. and that primarily due to an increase in price. Foodstuffs are scarce and prices are high; the number of marriages has declined so that the supply of goods such as the newly-married want has fallen off. Jewish shopkeepers are cancelling autumn orders on account of the uncertainty caused by the renewed anti-Jewish outbreak. The export trade has fallen badly, so that the total figure is only one-quarter of what it was in 1928—not that this is unique; the difficulty to-day in most countries is that trade is internal. Germany's special difficulty is a growing inability to buy raw materials abroad and the ban on the export of German money prevents many people from doing business with that country who might otherwise do so. It is not surprising to find Dr. Schacht warning the German people that their main difficulties in internal finance lie ahead since the sums spent in stimulating business and employment must one day be funded out of the savings of the people. In other words, to the shortage of food and raw materials and of goods of all kinds will one day be added a crushing burden of taxation. Perhaps this monetary difficulty of the nations of Europe is the most civilising force of the moment. General Hertzog has declared that a new spirit is abroad in Europe and Asia and has prophesied that we are on the verge of the most savage and uncivilised period of the world's history.

Air Conditioning and Poison Gas

STRONG criticism of the proposed methods of protection against the menace of poison gas was offered by Mr. Harry Barron in a letter to "The Times" recently. In his opinion they display a singular lack of imagination and ignore the possibility of successful resistance to poison gas attack. He points out that it has been taken for granted that in the event of gas attacks all activities must cease while protection is sought. This implies that factories would immediately cease work and manufacture would come to a standstill. In such circumstances industry would soon be paralysed. As a chemist, Mr. Barron has made a close study of the problem, and he explains that from the objective technical point of view the presence of poison gas in the atmosphere is merely an extreme case of air pollution. During recent years satisfactory methods for overcoming the trouble caused by air pollution have resulted from the application of the principles of air-conditioning. Why not treat the menace of poison gas from the angle of air pollution and employ air-conditioning to counteract it? he asks. The factory, building, or house is completely insulated from the outer atmosphere (except for doors). Air, which has been pre-treated to remove solid matter, obnoxious fumes or vapours, and brought to any desired temperature and humidity, is pumped in, and is subsequently removed through a special outlet. There is a strong pressure within the building which effectively prevents any entry of polluted air through doors or crevices. Suitably equipped buildings or houses could be protected against the entry of poison gases by the addition of efficient extracting devices. Present poison gases are not so stable that their decomposition or removal is particularly difficult. For example, a small extractor containing bleaching powder could remove quite large quantities of the dreaded mustard gas or lewisite, the conditioned air being quite free from them. Such a form of protection against poison gases offers great advantages. Occupants of safeguarded houses and buildings could live indefinitely in them, and could continue their normal activities. Factories could keep running and public buildings would be available for immediate shelter.

The application of air-conditioning is in any event a great social benefit, which has made much progress in the United States, having spread from industry to the private dwelling. It is already being applied in this country, and it is predicted that in the normal course of events within 10 years air-conditioning will be widely employed as refrigeration is to-day. If then the menace of poison gas is so imminent as to justify the precautions which are being taken, why should not the Government take immediate steps to apply air-conditioning for protective purposes? There is so much building going on that cheap but effective air-conditioning plants could, with official encouragement, be produced for incorporation into houses, as well as factories and public buildings.

Gas in Steel Containers

Supplies for Remote Communities

GAS in portable form is to be made available for domestic consumption throughout the rural areas where there are no mains conveying the usual coal-gas, under a scheme which was outlined when the Lord Mayor of Leeds (Alderman W. Hemingway) opened the first national demonstration of "Calor-gas" in Leeds on September 7. The demonstration, which showed the application of the fuel to a variety of burners, was attended by engineers and others from many parts of the country.

Calor-gas is a by-product of coal—a light hydrocarbon-butane mixture liquid under a compression of one and a half atmospheres—supplied in easily handled steel containers, each of which, it is claimed, will last an average family of three people, from six to ten weeks.

Mr H. Pickering, technical manager of the concern which is organising the system, said that in America it had been in use for twenty years and on the Continent for two years, during which period over half a millon Continental homes had been supplied.

The Lord Mayor said the gas did everything that coal-gas did, and did it just as well. It was made from British coals and could not be ignited by an accidental spark. It should prove an enormous blessing to people outside the congested areas, and it could be used equally well in cottage, lonely farmhouse or yacht.

Mr. C. S. Shapley, engineer of the Leeds Gas Department, said the popularisation of the new product would revolutionise the countryside. The gas industry was entirely behind this product, because it was believed that by its use the rural populations would become gas-minded and the way would be paved for the ultimate supply of ordinary coal-gas through the mains.

National Physical Laboratory

PAPERS published from the National Physical Laboratory during August included: "Note on the photometric integrator," by H. Buckley, M.Sc., F.Inst.P., and W. Barnett ("Journal of Scientific Instruments," Vol. 12, p. 258). "Examples of the electrical twinning of quartz," by L. Essen, B.Sc. ("Journal of Scientific Instruments," Vol. 12, p. 256). "An automatic frequency comparator," by N. F. Astbury, M.A. ("Journal of Scientific Instruments," Vol. 12, p. 245), and "A research into tests for materials in cold pressing operations with special reference to the fluid pressure cupping test," by H. J. Gough, M.B.E., D.Sc., M.I.Mech.E., F.R.S., and G. A. Hankins, D.Sc., A.R.C.S., A.M.Inst.C.E., A.M.I.Mech.E. ("Proceedings of the Institution of Automobile Engineers," Vol. 29, p. 543).

British Association Meeting, 1935

Papers Presented to the Chemistry Section

AT the meeting of the British Association, held this year at Norwich, many interesting and erudite papers were read. As is usual the chemistry section produced some very original research, and what is more research that is of practical value and application. Dr. Hirst's paper on "Optical activity and structure of sugars" was a masterpiece of its kind. If one refers back to Pasteur's original work on rotation, one can see the immense strides which have been made in this particular branch of chemistry. Dr. Morgan contributed a paper on "The function of polysaccharides in immunological specificity." Dr. Henry's researches into "Anti-malarial drugs of natural origin," should prove of great benefit in further combating the disease. A paper on the "Crystallographic evidence on the form of the pyranose ring" was presented by Mr. Cox. He has been examining crystalline carbohydrates by X-ray methods and his results indicate that the five carbon atoms in the pyranose ring are co-planar, the oxygen atom being displaced out of the plane. Such a ring-form requires the hydroxyl attached to the first carbon atom to be situated differently from the other hydroxyls with respect to the ring. Mr. Cox found that this was consistent with his other evidence and that the crystallographic configurations assigned to the α and β forms of various sugars.

Polysaccharides in Immunological Specificity

Following Professor W. N. Haworth's presidential address to the Chemistry Section on Thursday, September 5, Dr. W. T. J. Morgan presented a paper on "The function of polysaccharides in immunological specificity." He said the recognition of the important part played by polysaccharide substances in the specific serological reactions that take place between virulent forms of bacteria and the homologous antibacterial immune serum followed the discovery that filtrates from rapidly growing pneumococcus cultures contain a soluble product which gives specific precipitation with the homologous immune serum. Subsequently the serologically reactive material was identified as a complex polysaccharide which had been derived from the bacterial capsule. The capsular substance, which is different for each kind of bacterium, is responsible for the specific serological reactions of the organism with its homologous antibacterial immune-body.

Experiments with synthetic carbohydrate-protein antigens indicate that the ultimate specificity that is characteristic of bacterial polysaccharides depends upon (1) the stereochemical arrangement and the chemical nature of the groups attached to the terminal carbon atom of each hexose molecule, (2) the position of the linkages that join the hexoses together, and (3) the configuration of the hydroxyl groups of the hexoses that exist within the polysaccharide complex.

Optical Activity of Sugars

In his paper on "Optical activity of sugars," Dr. E. L. Hirst, F.R.S., said the numerous empirical rules by which attempts have been made to correlate structure with optical rotatory power in the sugar group are valid only within narrow limits. For example, if the lactones of sugar acids and their methylated derivatives followed invariably an extension of Hudson's lactone rule, both tetramethyl γ-gluconolactone (I) and tetramethyl γ-mannonolactone (II) would be dextro-rotatory. This is true for (I) in all solvents, but the rotation of (II) may be strongly positive or negative, according to the solvent used. The rotatory power of (II) is expressible by the formula $\alpha = k_1/(\lambda^2 - 0.06) - (k_2 \lambda^2 - 0.02)$ and is dependent upon absorption bands at wavelengths given by $\lambda^2 = 0.06$ and $\lambda_2^2 = 0.02$, and associated respectively with the dissymmetric double bond of the carbonyl group and with the single linkages in the molecule. In the far ultra-violet the lactone rule is always obeyed, but wide departures from the rule are encountered in the visible region in those solvents for which $k_2 > k_1$.

The amide rule, which applies to many α-hydroxy- and α-methoxy-aliphatic acid amides, depends on the induced dissymmetry of the CO group and the configuration of the second carbon atom determines the rotation. Failure to follow the rule cannot be explained in terms similar to those used in the case of (II). In 4 : 6-dimethyl mannonamide the sign of the induced term is opposite to that which would be expected. The result is attributable to the vicinal effect of the cis hydroxy groups which are responsible also for the failure of α- and β-mannose to follow the iso-rotation rules.

Dr. S. R. Carter's paper on "The determination of molecular weights of carbohydrate derivatives by osmotic pressure measurements" dealt mainly with methylated and acetylated derivatives of carbohydrates of molecular weight between 1,500 and 50,000 in solutions of organic solvents. According to the theory of van't Hoff a 1 per cent. solution of a substance of molecular weight 20,000 should produce an osmotic pressure of *ca.* 10 cm. water pressure. The liquid may be a colloid dispersion rather than a molecular dispersion, but we have assumed that the osmotic pressure $P = RTn/N$ where n = number of particles in unit volume and N = Avogadro's Constant.

Method of Procedure

The solutions in these investigations were usually made up in chloroform and the semipermeable membrane was a disc of "Viscacelle" adjusted for porosity by immersion in alcohol-water mixtures. The osmometer consisted of two glass bells, accurately ground and clamped together, the membrane being enclosed between the ground joints. One bell contained the solution (5 cc.) and was connected to an air chamber and a water or mercury manometer, whilst the other bell contained pure solvent. The pressure was adjusted by trial until no movement of the solvent occurred as judged by the position of the meniscus in a capillary connected with the solvent bell. The thermostat was kept at 20.00°±0.01° C. The concentration of the solution was determined by weighing the evaporated residue from 1 c.c. on the micro-balance. The observed pressure P is related to the concentration by the equation $P = cRT + kc^n$. The values of P/c are graphed against c and extrapolated to zero concentration, when the last term vanishes and $P = cRT$. The molecular weights so determined agree with the values obtained by the chemical methods.

The Shape of the Pyranose Ring

Crystallographic evidence on the form of the pyranose ring was presented in a paper by Mr. E. G. Cox. Owing to the complexity of the problem, no complete structure determination by X-ray methods has so far been carried out in the case of crystalline carbohydrates. Much preliminary work has been done during the past few years, sufficient in fact to establish certain results not directly accessible by purely chemical methods. The most important of these is concerned with the shape of the pyranose ring; apart from its intrinsic interest this has considerable bearing on the linking of monose residues in polysaccharides. It is generally supposed that the pyranose ring possesses a "strainless" puckered form; this involves the unwarrantable assumption that the "strainless" angle between the valencies of an asymmetric carbon atom is 109½° and ignores the different radius and valency angle of the oxygen atom. Since a hexo-pyranose of given configuration can possess no less than eight "strainless" forms (excluding mirror-image forms), direct experimental evidence is clearly desirable.

The X-ray results which have been obtained from about seventy crystalline carbohydrates were discussed by Mr. Cox. It appears that the five carbon atoms in the pyranose ring are co-planar or nearly so, the oxygen atom being displaced out of the plane. Various implications of this result will be discussed—*e.g.*, such a ring-form requires the hydroxyl attached to the first carbon atom to be situated differently from the other hydroxyls with respect to the ring; this is in agreement with other evidence. The crystallographic results are found to confirm the configurations assigned to the α and β forms of various sugars.

On Friday, September 6, the Chemistry Section held a discussion on "Surface phenomena, with special reference to substances which occur in Nature."

Professor H. Freundlich dealt with the " Displacement of chemical equilibrium at surfaces." He said chemical equilibrium may be displaced by adsorption on surfaces; this is shown very directly by using indicators. The most convincing experiments are where the colour of an indicator changes, when a surface is produced by emulsifying one liquid in another, and where the original colour of the aqueous solution reappears, when the two phases separate again (Deutsch). If the second liquid is organic, the displacement is always in such a direction that the electrolytic dissociation of the indicator is decreased, compared with its state in the aqueous phase. The reverse takes place if an indicator, for instance a carbinol base, is dissolved in the organic liquid: on shaking with water, the change of colour may indicate the formation of more strongly dissociated substances. A similar displacement of equilibrium has been observed at surfaces between liquids and gases or solids (quartz cellulose).

Indicators may change their colour in the presence of surfaces of colloidal particles. With colloidal electrolytes the following " sign rule " holds: Colloidal cations only influence the equilibrium of indicators where the colour change is due to a reaction between anions, and *vice versa* (G. S. Hartley). The same rule applies to the influence of proteins on the colour of indicators (Thiel and Schulz). A displacement of equilibrium has also been found on charcoal with organic substances of low molecular weight, not indicators. The substances which are stable in adsorption layers may be very different from those stable in the bulk of a liquid.

Some Aspects of Enzyme Action

Discussing "Some aspects of enzyme action," Professor E. Walschmidt-Leitz pointed out that in the case of protein-splitting enzymes, there are specific chemical groups both in substrate and enzyme, through which the specific reactions between enzyme and substrate take place. The various enzymes can be differentiated according to their different modes of reaction with both polypeptides and true proteins. The activation of enzymes, and its mechanism, are of particular interest. It may be explained either by the development of a specific active group, through the activator, or by a surface action, *e.g.*, supplying the enzymatically active group with a suitable colloidal bearer. Enzyme action in general is a surface reaction between definite chemical groups.

The subject of " Unimolecular films of fatty substances on water " formed a contribution from Dr. N. K. Adam, F.R.S. He said Langmuir showed that insoluble substances such as long chain acids, alcohols, fats and sterols, which have one or two water-attracting groups in the molecule, form films only one molecule thick on a water surface, with the molecules oriented so that the water-soluble groups are next the water. These films are found in states corresponding to the solid, liquid, and gaseous states of matter in three dimensions, the state of the films being determined mainly by the amount of lateral adhesion between the molecules. Different films show different degrees of tilt of the molecules; there is only one water-attracting group, situated at the end of the molecules, they usually stand vertically; two widely-separating water-attracting groups usually cause the molecules to lie flat; in the interesting " expanded " state of the films the molecules probably have their hydrocarbon chains in violent whip-like agitation, yet the films are coherent. Such films often give valuable information as to the size, shape, and constitution of the molecules.

Reactions in Unimolecular Films

In his paper on " Chemical reactions in unimolecular films" Dr. A. H. Hughes laid stress on the fact that whilst the familiar investigation of unimolecular films by the Langmuir-Adam trough has given much detailed knowledge of the physical properties of this state of matter, the more recently developed technique of " surface potentials " has provided a means of measuring a chemical reaction occurring in the unimolecular film. The surface potential of a film is related to the dipole moment of the constituent molecules; thus chemical change taking place therein is reflected in a change in the observed surface potential. Simple types of chemical change which have been examined in this manner include the ionisation of a fatty acid (such as myristic or palmitic), the oxidation of unsaturated molecules (oleic acid and its isomers and various sterols oxidised by acid $KMnO_4$), the hydrolysis of lactones, and complex formation (*e.g.*, the reaction of concentrated HCl and a film of an alcohol or an acid to form an oxonium compound, and the effect of heavy metal ions in the solutions).

In certain cases, notably the oxidation of oleic acid and the hydrolysis of γ-stearolactone, the reaction velocity is affected markedly by the orientation of the molecules. By suitable compression the molecules in the film can be so arranged that the reactive group is not accessible to the reagent in the underlying solution. This accessibility factor has been studied in the case of the oleic acid oxidation. With the hydrolysis of γ-stearolactone the absolute reaction velocity has been studied and shown to be amenable to treatment by the kinetic theory of solutions.

Surface reactions in biology were the subject of a paper by Dr. J. H. Schulman. The method of surface potentials has been applied to measure the polar properties of compex biological molecules and to follow the course of a reaction which these substances may undergo with compounds injected into the underlying solution. This has been applied especially to those reactions which are believed to occur at interfaces in physiological systems, such as enzyme, immunity, and hæmolytic reactions.

Prevention of Malaria

Opening a discussion on the " Chemotherapy of Malaria," on Monday, September 9, Lt.-Col. S. P. James, F.R.S., said the British Empire, with its vast malarious territories in the tropics, is more concerned with the provision of effective anti-malarial drugs than is any other nation in the world. Until recently the alkaloids of cinchona bark were the one and only effective remedy available. These natural products, however, are not effective for certain therapeutic purposes, particularly for true causal prophylaxis, the prevention of relapses and the prevention of spread. The aim of chemotherapy is to find preparations which will be effective for those purposes. Two remarkable synthetic anti-malarials, namely, plasmochin and atebrin, have been discovered and prepared on a large scale in Germany and their merits and defects for the particular purposes mentioned are now being assessed in the laboratory and in the field. Their discovery has given a great stimulus to chemotherapeutic work.

Methods and plans which are being tried or have been suggested for extending anti-malarial chemotherapy research in England, where as yet it has been entirely neglected by the chemical industry and has received almost no financial assistance from Government or other sources, were outlined by Lt.-Col. James.

Professor Dr. W. Schulemann dealt with methods of chemotherapeutic research as exemplified by the anti-malarial drugs, and Professor R. Robinson, F.R.S., gave an account of the synthesis of the potential anti-malarials and the relation between constitution and anti-malarial action. Attention was directed to the pressing need for further investigations and some suggestions were advanced as to the organisation of the research on the chemical side.

Anti-Malarial Drugs

Anti-malarial drugs of natural origin were discussed by Dr. T. A. Henry. The investigation of natural drugs having a local reputation as remedies for malaria, *e.g.*, the Alstonias of Australia, India, West Africa and the Pacific Islands, from which Goodson and Sharp have isolated a group of alkaloids is of scientific interest, but these drugs are devoid of anti-malarial activity. The determination of the relative activities of the various cinchona alkaloids is a matter of practical importance in view of the introduction of crude mixtures of cinchona alkaloids as a means of mass-treatment of indigent malarial populations. For this purpose the eight principal cinchona alkaloids have been prepared in a pure state and tested in bird malaria, the results showing that they can be arranged in the following descending order of activity: Hydroquinine, quinine, hydroquinidine, cinchonidine and quinidine, cinchonine, hydrocinchonine and hydrocinchonidine. The effects of modification in the molecular structure of cinchona alkaloids on anti-malarial action was also discussed by Dr. Henry. In general it may be stated that any change which diminishes the basic character of such an alkaloid as quinine reduces its anti-malarial activity, though it may result in the development of pharmacological activity of another kind.

Dealing with the proteins of grasses, as one contribution to

a discussion on " The chemistry of grass crops," on Tuesday, September 10, Professor A. C. Chibnall outlined the conventional methods used by agricultural chemists to evaluate the nitrogenous constituents of forage crops.

The chemical composition of grassland herbage and its relation to fodder conservation and nutritive value was dealt with in a joint paper by Mr. H. J. Page and Dr. S. J. Watson. The influence of various factors on the composition of grassland herbage, manurial and climatic factors, stage of growth, and botanical composition was considered in relation to the organic and mineral constituents of the herbage with particular reference to protein and non-protein nitrogen, calcium and phosphorus, and carotinoid pigments. The influence of methods of fodder conservation on chemical composition of the product; artificial drying and ensilage; protein and carbohydrate breakdown, and the relation of chemical composition of fresh and conserved grassland herbage to its nutritive value were also discussed.

Professor A. I. Virtanen, in his contribution on " The chemistry of grass crops," spoke of the uptake of nutrients by plants, particular attention being paid to nitrogenous nutrients and to the ability of plants to utilise organic nitrogenous compounds. In regard to nitrogen metabolism of the leguminous plants he dealt with uptake of nitrogenous nutrients from the nodules, excretion of amino-acids from the nodules, and nitrogen-fertilising of non-leguminous crops in associated growth with legumes. The composition of protein undergoes considerable changes during different stages of plant growth, and the vitamin content of plants reaches a maximum before or at the start of blooming. These facts should be considered in cutting forage crops. In the carbohydrate metabolism of plants attention is paid to the easy interconvertibility of different sugars. The inversion of cane sugar takes place chiefly in the stems and leaf-ribs, which possess a high invertase activity. The nature of the sugar compound utilised by the nodule bacteria of leguminous plants in the fixation of nitrogen is still unsettled. One of the chief problems of practical agriculture, the preservation of immature forage crops at a stage when their nutrient content is highest, was solved by the A.I.V. process.

The cell-wall constituents of grasses—pectin, hemi-celluloses, lignin, etc., the fractionation of hemicelluloses; sugars and sugar acids—were the subject of a paper by Dr. H. W. Buston.

Industrial Research in its Engineering Aspects

D.S.I.R. Exhibits at the Shipping, Engineering and Machinery Exhibition

ONE of the main features of the exhibit arranged by the Department of Scientific and Industrial Research at the Shipping, Engineering and Machinery Exhibition, which opened at Olympia on September 12, is a cinema display illustrating various aspects of industrial research and the industrial background in which the research work finds application. In addition exhibits are provided illustrating some of the work of the National Physical Laboratory, the Fuel Research Station, the British Non-Ferrous Metals Research Association, the British Cast Iron Research Association and the Industrial Research Council of the British Iron and Steel Federation.

The Fuel Research Station at East Greenwich, and nine laboratories in the coal fields, are now engaged in examining the coals of the country, and studying various processes involved in their preparation and use. Large-scale investigations designed to translate the observations of the nine laboratories situated in the coal-producing areas into terms of industrial practice are undertaken at Greenwich

Hydrogenation-cracking is a process by which tars and oils may be converted into lower-boiling products, mainly hydrocarbon in nature, by treatment with hydrogen under high pressures at elevated temperatures. By suitably adjusting the temperature, pressure and other variable factors, it is possible to manufacture motor spirit or fuel oil or any proportion of the two. In order to obtain good yields of motor spirit or fuel oil, it is necessary to employ a catalyst or accelerator. A suitable catalyst is molybdenum sulphide, which is conveniently, but not necessarily, carried on a porous support such as alumina gel.

Hydrogenation-Cracking Plant

An experimental semi-technical scale plant has recently been erected at the Fuel Research Station as a result of a series of experiments in laboratory-scale apparatus. This plant, which is capable of treating 300 gallons of tar per day, has been designed to study the hydrogenation-cracking process on a scale sufficiently large to indicate possible results in commercial practice. By one treatment at 480° C. and 200 atmospheres pressure, 100 gallons of low-temperature tar yield 108 gallons of oil, of which 55 gallons are spirit boiling below 200° C. The oil boiling above 200° C. may be used directly as a fuel oil or may be recycled to produce more spirit; by complete conversion, 100 gallons of tar yield 101 gallons of motor spirit.

So-called " colloidal fuel " is a quasi-stable mixture of finely powdered coal with petroleum or other fuel oil. It combines the cheapness of coal with the flexibility of oil in handling and use, and is thermally more compact than either. It is essential that such suspensions should be sufficiently stable, and the conditions requisite to ensure this have been studied. Not all oils are suitable for making coal-oil mixtures of the requisite stability. Usually, straight-run oils are unsatisfactory, but they may be rendered satisfactory by various means. The samples exhibited show the diverse effects of subsequent treatment on a single oil originally quite unsatisfactorily.

The exhibit of the British Cast Iron Research Association shows some of the directions in which research has contributed to the remarkable improvement in quality of cast iron in recent years.

The properties of cast iron depend on its structure. This structure can be varied by altering both the chemical composition and the rate of cooling of the casting in the mould, and in this way a wide variation in the properties of cast iron can be obtained according to the service conditions to be withstood. The experience of iron-founders over a large number of years, however, has been that some unknown factor plays an important part in deciding what the ultimate properties of a casting will be. In other words, it is not always possible to predict the properties from a knowledge of the chemical composition and the cooling conditions in the mould.

Altering the Structure of Cast Iron

The structure of cast iron can be altered and it can be white or grey. If the latter is the case, the graphite size can vary from extremely coarse to extremely fine. The two extremes of cast iron structures are white and grey; the former is composed mainly of white iron and the latter graphite flakes in a steely matrix. White iron is extremely hard and brittle, and its presence makes the casting similarly hard and brittle. On the other hand, the presence of large amounts of graphite with the consequent absence of white iron makes the casting much softer. It has been noticed, however, that fine graphite formation confers more strength on the casting than does coarse graphite, and from a strength point of view the intention is always to produce graphite in as fine a form as possible.

In the past, the only means available to the iron-founder whenever he required to vary the properties of cast iron have been the changing of the chemical composition or else varying the rate of cooling of the casting in the mould. While these methods have been satisfactory up to a point, they have certain serious disadvantages. For instance, if a very strong iron is required, the measures adopted to obtain it cause the molten iron to possess very poor founding properties, so that sound castings become more difficult to make.

Recent work by the British Cast Iron Research Association, however, has shown that it is possible to attain these

objects without having to resort to drastic changes in the chemical composition or without having to introduce a special technique in the moulding in order to govern the rate of cooling. For instance, it is now possible, in irons of the same composition, to have totally different structures and consequently very different properties. An iron in which the graphite, for instance, is in the extremely coarse condition, can have a transverse strength of 15 tons per square inch. Without varying the composition in any way but by controlling the melting, the strength can be raised to double this figure without introducing any fresh difficulty in the founding. This is illustrated in the exhibit by fractures of 3 in. diameter bars representing melts subjected to various treatments which have modified their structures and properties. The effect produced by the treatments on the structure can be seen by an examination of various specimens under the microscope.

For a number of years research into many aspects of the manufacture, and certain aspects of the use, of iron and steel has been carried out upon a national basis by the British Iron and Steel Federation (Industrial Research Council).

When molten steel is poured into ingots and castings, the resulting mass is not perfectly homogeneous. The study of this and other related phenomena is engaging the attention of the Heterogeneity of Steel Ingots and Steel Castings Research Committees: and the results of their researches will be of interest to all those who employ steel in either the forged or cast form.

Heterogeneity of Steel Ingots

During the past eleven years an immense amount of experiment, both on a works and a laboratory scale, has been carried out under the Heterogeneity of Steel Ingots Committee; and several reports, which are well known throughout the metallurgical world, have been issued. The early work consisted of a painstaking and exhaustive examination of ingots ranging in size from half-a-ton or less up to more than 100 tons, and resulted in the formation of a clear picture of the actual segregation and possible defects found in ingots made according to different industrial practices. The work was then developed to determine more precisely the exact effect of each of the many factors, such as the condition of the steel in the furnace, methods of de-oxidation, teeming temperature, rate of teeming, mould design and the temperature of the mould, upon the quality of the ingot; and was further expanded to embrace semi-skilled and rimming steels as well as killed steels.

Work in hand at the moment is of a more fundamental nature. The committee is investigating methods of determining oxygen and non-metallic inclusions in steel, as well as the effect of the conditions of manufacture upon their concentration and distribution. Ultimately the committee hopes to establish with reasonable certainty the mechanism of segregation in steel ingots, and to this end is proceeding with the study of the solubility in iron and mutual solubility of sulphides, phosphides, carbides, silicates and other non-metallic impurities, as well as the effect on the soundness of ingots of the different gases present in the steel-making furnace. Already a number of principles, which should be followed in order to produce a satisfactory ingot, have been established, and although a perfect steel ingot is probably theoretically impossible, this work has resulted in a greatly improved technique of ingot manufacture.

Mechanical Strength of Castings

Research is being carried out at the Research Department, Woolwich, on the mechanical strength of castings at temperatures just below their freezing point. The question of fluidity, as distinct from temperature, is also being investigated in detail; and, in conjunction with the Heterogeneity Committee, research is in hand upon the whole question of oxygen in steel.

Future developments in this programme will probably include a fundamental research into the mineralogical and physical properties of different moulding sands, and a study of the volume changes occurring in steel on cooling from the molten condition. Ultimately, this work of a fundamental nature will be applied to ordinary foundry practice in determining, for instance, which are the most satisfactory melting processes for each particular type of casting, the effect of carbon and alloy content upon freedom from cavities and cracks, the factors which must be controlled to reduce hot pulling and tearing to a minimum, and the numerous other problems which confront the foundryman in his everyday work.

The British Non-Ferrous Metals Research Association is represented by an exhibit illustrating the progress made in three of its fifty-five major researches which have been completed or which are still in progress. The subjects chosen are the corrosion of condenser tubes, the founding of aluminium alloys, and the electrodeposition of metals.

Research on the corrosion of condenser tubes has been in progress for a considerable time. Although directed particularly towards the investigation of the causes and prevention of corrosion in condenser tube materials, the work has been of a fundamental nature, and the information gained has added considerably to the knowledge of the mechanism of corrosion generally, and the results obtained have a wide general application. The different types of attack encountered in service have been investigated and classified according to the mechanism of failure. Various types of attack are illustrated, together with the laboratory tests which have been developed to show the resistance of tube materials to particular conditions of service. The modifications in composition which are necessary to render tube materials more resistant to certain corrosive conditions are shown with particular reference to the importance of the film-forming properties of the materials.

Research on aluminium founding has been largely concerned with the causes and avoidance of pinholing in cast, particularly sand cast, aluminium alloys. The fundamental cause of this defect, which is the evolution of hydrogen by the solidifying metal, is shown to be due to the differing solubility of hydrogen in the liquid and solid metal. Hydrogen contamination can occur during melting by reaction with the furnace atmosphere, particularly with water vapour, and can also result from corrosion of the metal in the solid state prior to melting. Specimen castings illustrate the occurrence of pinholes in castings after exposure of the metal to unfavourable conditions of storage or melting.

Some aspects of the work on the electrodeposition of metals, including nickel and chromium plating for decorative and protective purposes and for the repair of worn parts, are shown. These researches, which were carried out at the Research Department, Woolwich, with the support of the Department of Scientific and Industrial Research and of the Research Association, have now been taken over by the British Non-Ferrous Metals Research Association. Methods of securing good adhesion, freedom from pitting and from porosity are shown, and the effect of varying conditions of deposition on the properties of resulting deposits indicated. Laboratory tests for adhesion are also illustrated, together with porosity tests for cathodic and anodic coatings.

Imperfectly Dressed Seeds

New Identification Method

A SIMPLE method has been evolved by Imperial Chemical Industries, Ltd. for ensuring the identification of undressed or imperfectly dressed seeds. The method consists of the incorporation in the Agrosan G of a dyestuff by which colour tests can be made. In the past farmers who have used dressed seed have frequently found patches here and there in the field where the dressing appeared not to have done its work effectively. The cause of this unevenness is due to the application rather than to the dressing used.

A dyestuff is now embodied in the mercurial dressing which is harmless to the seed itself and in no way detracts from the efficiency of the dressing. To test a sample of seed dressed with Agrosan G, the farmer need now only take a small quantity of seed supposed to be dressed and place it in a tumbler or small jam jar. He should then cover the seed with petrol, and, after letting this stand for a couple of minutes, pour off the petrol into another glass. If there is any Agrosan on the seed the colouring matter is now dissolved in the petrol, and the intensity of the colour of the petrol is the index of the amount of dressing present on the seed.

With the aid of a graded colour chart, which is supplied by Imperial Chemical Industries, Ltd., the colour can be matched up with a pattern indicating the shade of pink which should be obtained from correctly dressed seed.

Camphor and Camphor Oil from Mauritius

Present Marketing Prospects

A REPORT is published in the July number of the "Bulletin" of the Imperial Institute of an investigation of camphor and camphor oil from Mauritius. The report states that it has long been known that certain camphor trees yield an oil from which no solid camphor can be separated. This is the case, for example, in Mauritius. Eight samples of the oil from that Colony examined at the Imperial Institute in 1912 and 1913 were all abnormal in character, whilst of six samples received in 1927, only two yielded camphor when cooled to a very low temperature, and this only in very small amounts (1 to 2 per cent.). The Director of Agriculture informed the Imperial Institute in 1927 that out of 200 trees examined only two were found to yield solid camphor.

In view of these results it was decided to carry out further experiments in Mauritius, and in 1927 seeds of *Cinnamomum Camphora* from trees known to yield solid camphor were imported from Formosa and planted at the Botanical Gardens, Curepipe (altitude 1,850 ft.). The trees have grown well and in 1931 they were pruned, and the leaves and twigs collected were distilled. The Chemical Division of the Department of Agriculture reported that out of 169 samples treated seventeen gave oil only and the rest solid camphor. These oils were light-coloured and had a fine odour; they had the following characteristics:

Specific gravity at 20° C.	0.8831
Refractive index at 20° C.	1.4669
Specific rotation	+ 14° 34′

The rotation of the oils is of interest as the typical Mauritius camphor oils are lævo-rotatory. In 1934, the distillation was carried out on a larger scale (785 kilos of leaves and twigs being treated), and a yield of 1.4 per cent. of solid crude camphor was obtained. A sample of this camphor, together with camphor oil which had been separated from it by filtration, was forwarded to the Imperial Institute by the Director of Agriculture in January, 1935. The results of their examination are given below.

Results of Examination

Crude Solid Camphor.—This sample consisted of a mass of small camphor crystals in a rather moist condition. On pressing a representative portion of the sample 13 per cent. of oil and water (mostly the latter) was expelled.

Camphor Oil.—This was a clear, very pale greenish-yellow oil, from which a small amount of solid camphor had separated. On cooling the oil to 0° C. for several hours a further quantity of camphor separated. Together, these quantities amounted to a yield of 10 per cent. of solid camphor from the oil. After removal of this 10 per cent. of solid camphor the oil was found to have the following constants:

Specific gravity at 15.5°/15.5° C.	0.9189
Optical rotation α_D	+ 33.22° at 16° C.
Refractive index $\mu_{D20°}$ C.	1.4754

By repeated fractional distillation of this residual oil, and cooling of the appropriate fraction, a further 26 per cent. of solid camphor (calculated on the oil as received) was obtained, making a total of 36 per cent. recovered from the original oil. The results of the fractional distillation of the residual oil are shown in the following table, in comparison with figures obtained at the Imperial Institute for a sample of oil distilled from camphor leaves and twigs in Burma:

Fraction boiling at	Present Sample. On residual oil after removal of solid camphor separated at 0°C.	Present Sample. Calculated on oil as received	Burma Camphor Oil. On residual oil after removal of solid camphor separated at 0°C.	Burma Camphor Oil. Calculated on oil as received.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Up to 195° C.	25.7	23.1	31.0	29.1
195° to 225° C.	20.1	18.1	9.3	8.8
225° to 245° C.	2.7	2.4	5.2	4.9
Above 245° C.	15.2	13.7	18.6	17.5
(Camphor)	(28.8)	(36.0)	(28.3)	(32.6)
Total*	92.5*	93.3*	92.4*	92.9*

* *The quantity of oil unaccounted for in each case represented losses sustained in the separation of the camphor by filtration and pressing. It is not possible to allocate these losses definitely to any particular fraction, but they would consist principally of camphor and oil from the fraction boiling at 195° to 225° C.*

The light camphor oil, *i.e.*, the fraction boiling at temperatures up to 195° C., had a specific gravity of 0.8617 at 15.5° C. This fraction was found to contain 2.0 per cent. of cineole as determined by the ortho-cresol method, equivalent to 0.5 per cent. of the original oil. It may be mentioned that in oil distilled from Indian-grown camphor leaves Simonsen found 0.7 per cent. of cineole, calculated on the oil from which solid camphor had first been separated by cooling.

In order to ascertain whether any safrole was present in the oil the fractions boiling at 195°-225° C. and 225°-245° C. were redistilled, and a fraction was obtained which boiled at 220°-240° C. and amounted to 1.6 per cent. of the original oil. This fraction was redistilled and separated into three fractions, boiling respectively at 220°-225° C., 225°-232° C., and 232°-240° C. These fractions were then examined for safrole by cooling them to −20° C. for 17 hours. All three fractions remained liquid at this temperature, and as the solidifying point of safrole is about +11° C. it is evident that the amount of safrole in the oil, if any, was exceedingly small.

The results show that the present sample of oil, as received, was similar in composition to ordinary camphor leaf oil and contained much camphor in solution. It was thus very different from the oils received at the Imperial Institute from Mauritius in 1927, which resembled eucalyptus oils and contained little or no camphor.

Yield of Solid Camphor

The yield of 1.4 per cent. of crude solid camphor obtained from the leaves by the Department of Agriculture appears very satisfactory, if, as is presumably the case, the figure is expressed on fresh green leaves containing 50 per cent. or more of water. This result is higher than most of the yields recorded from camphor leaves grown in other parts of the world, apart from the additional camphor which could be obtained from the oil by fractional distillation. In this connection it is of interest to quote the following figures of the yield of camphor and oil obtained from air-dried[1] camphor leaves and twigs from St. Lucia and Uganda previously examined at the Imperial Institute:

Description of material	Yield of solid camphor separated by filtration and expression.	Additional camphor obtained from residual oil by fractionation.	Amount of residual oil	Total yield of solid camphor and oil.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Air-dried leaves and twigs from St. Lucia containing 9 per cent. of moisture	1.9	0.3	0.7	2.9
Air-dried leaves and twigs from Uganda containing 12 per cent. of moisture	1.6	—	—	2.3

The present Mauritius oil differs widely from the commercial camphor oils marketed in the United Kingdom, which are fractionated products obtained by the redistillation of crude residual camphor *wood* oil from which all solid camphor has first been removed by filtration and pressure. In the case of Japanese camphor oil the operations of fractionation and the cooling of the fractions to separate the camphor are so effectively carried out that the final product contains little or no camphor. The principal commercial oils are Japanese "light" (or "white") camphor oil and "heavy" (or "brown") camphor oil. The "light" oil (specific gravity 0.87 to 0.91) would correspond to the first fraction obtained in the distillation of the present Mauritius oil, and consists of terpenes with some cineole.[2] The "heavy" camphor oil (specific gravity usually from 1.018 to 1.026) represents the higher-boiling fractions of the crude camphor wood oil, and is the chief commercial source of safrole, of which it contains from 25 to 35 per cent. This Japanese "heavy" oil thus differs from the higher-boiling fractions of the present leaf oil, which contain little or no safrole.

[1] Eaton (*Bulletin of the Department of Agriculture, Federated Malay States, No.* 15, 1912), has shown that air-drying of camphor leaves has no detrimental effect on the yield of camphor and oil.

[2] One sample examined at the Imperial Institute contained abont 30 per cent. of cineole.

It may be mentioned that supplies of Japanese "heavy" camphor oil are becoming scarce in Europe, owing to the utilisation of the oil in Japan for the extraction of safrole and the manufacture of heliotropin. In the United Kingdom the present impure sample of solid camphor would be now worth less than 2s. a pound (June, 1935), which is the present comparatively low price of Japanese *refined* camphor, and at this price it seems doubtful whether its production in Mauritius would prove very profitable, especially in view of the fact that the yield of camphor from camphor leaves is small compared with the 3 to 4 per cent. or more obtained from the wood in Formosa.

The present oil, if fractionated, in Mauritius, would yield an additional amount of solid camphor, and a low-boiling fraction would also be obtained which, like Japanese "light" camphor oil, could be utilised as a turpentine substitute. The present price in London of Japanese "white" camphor oil is 95s. per cwt. duty paid. The higher-boiling fractions would be of much less value than Japanese "brown" camphor oil as they contain little or no safrole.

The prospects of marketing camphor oil as represented by the present sample are not promising, as the camphor oils required by the trade are fractionated products. If it is not possible to undertake the fractionation in Mauritius, and it is desired to find a market for the unfractionated oil, it was suggested that a small trial consignment (1-2 cwt.) might be forwarded to the Imperial Institute in the first place to test the market. The price obtainable will probably depend on the amount of camphor present and the suitability of the oil for the preparation of liniments and embrocations.

International Society of Leather Trades' Chemists

Bi-Annual Meeting at Brussels

THE bi-annual conference of the International Society of Leather Trades' Chemists, together with that of the sister society, the Internationalen Vereins der Leder Industrie Chemiker, was held at the Institut des Arts et Metiers, Boulevard de l'Abattoir, Brussels, from September 1 to 6. The number attending constituted practically a record for any conference, and included representatives from France, England, Germany, Czecho-Slovakia, Holland, Roumania, Switzerland, Italy, Hungary, Austria, Spain, Sweden, Turkey, Poland, Yugo-Slavia, and Denmark, in addition to a large number of Belgian members of the Society. The participants were welcomed on the Sunday evening at the Palace Hotel, by the organising committee of the conference. The reception afforded a good opportunity for the friendly interchange between leather chemists from the various countries.

The Opening Meetings

The conference opened on Monday, September 2, under the presidency of M. H. Colchen, president of the Belgian Section of the I.S.L.T.C., assisted by M. Van Gijn (president of the I.V.L.I.C.) and M. C. R. Loos (president of the I.S.L.T.C.). On behalf of their respective societies M. Loos and M. Van Gijn offered to the Belgian Section of the I.S.L.T.C. their deepest sympathy in the sadness which had overwhelmed Belgium in the tragic death of Queen Astrid, the meeting rising for one minute's silence in memory. M. Colchen thanked the meeting for its kind expression.

Separate meetings of the two societies were then held to discuss business and commission matters, M. C. R. Loos taking the chair at that of the I.S.L.T.C. M. Loos, in his opening address, talked on the subject of "quality" as it affected leather, and mentioned many improvements which had been made in this direction.

The executive committee for the years 1936-7 was elected as follows:—President, M. G. Colchen (Belgium); first vice-president, M. C. R. Loos (Belgium); second vice-president, W. R. Atkin (England); hon. treasurer, Professor D. McCandlish (England); hon. general secretary, Dr. J. Gordon Parker; members, Dr. P. Chambard (France), Dr. A. Gansser (Italy), R. Paniker (Spain), L. Masner (Czecho-Slovakia).

On the proposition of the president, Dr. J. Gordon Parker was made an honorary member of the Society. Dr. Parker, thanking the Society, remarked that he was always pleased to further the work of the Society which he had had at heart since its formation.

Next Meeting at Copenhagen

Invitations for the 1937 conference were then discussed, and it was decided to accept that of the Danish Section of the I.V.L.I.C. and hold the next joint conference in Copenhagen. The official methods of analysis were to be published in permanent book form, and it was hoped to have this publication available by the end of the present year.

A lengthy debate took place on the work of the Tannin Analysis Commission regarding the adoption of the recommendations of that commission on the question of filtration. It was voted that as from January 1 next, the only official method for filtering tannin solutions in the analysis of tanning materials, should be the candle method. The commission was to do further work on the questions of (a) the use of kaolin in filtration, and (b) the use of a pre-chromed dry hide powder.

Mr. F. C.. Thompson was elected joint convener of the commission in the place of Dr. J. Gordon Parker, who had resigned.

A paper on "The Action of Acids on Vegetable Tanned Leather" was presented by Dr. V. Kubelka, E. Weinberger and O. Heger. In their investigation, special attention was devoted to the determination of the nitrogenous matter extracted by water and by a 1 per cent. soda solution. It has been found that damage to a leather can be detected in its very earliest stages. Much more nitrogenous matter is extracted from such a leather by treatment with water followed by the soda solution than is the case with a sound leather. The authors found that from sound vegetable leathers of various kinds, and composition, usually not more than 0.8 per cent "hide substance" is extracted. This figure is considerably increased by the addition of acid to the leather even in those cases where the other properties of the leather do not denote damage.

Method for Determining Acid Damage

A method was worked out on this principle for determining the acid damage of vegetable tanned leathers which can be carried out very easily and rapidly in conjunction with the ordinary analysis of leather. The details are given in the original publication. The method was applied to a number of suitable samples prepared from a pure oakwood and a pure chestnut leather. Of the acids tested, it was found that hydrochloric and sulphuric acids caused approximately the same amount of damage to both types of leather. At higher concentrations and with a longer period of action, hydrochloric acid was found to be more harmful than sulphuric acid. Oxalic acid damaged both leathers much less than the inorganic acids and the damage occurred only after a longer time of action. Acetic acid was found to be harmless up to an addition of 10 per cent. and a time of action of one month.

In a paper on "Sludge Formation in Tan Liquors," V. Kubelka and V. Nemec said they had examined the effects of various conditions on sludge formation, in particular the influence of concentration, temperature, *p*H, etc. The amount of sediment formed was determined by two volumetric methods, sedimentation and centrifuging, and also by a gravimetric method. By the use of the so-called fractional centrifuging, the particle size of the sediment was determined approximately. An increase in the concentration of the tan solution brought about in the majority of the experiments an increase in the volume and weight of the separated sludge which attained to a maximum characteristic for each species of tan. A further increase in the concentration beyond this maximum point caused a decrease in the amount of sludge formed. The relation between the volume of the sludge and its weight changes as the concentration alters. This con-

firms previous findings of Kubelka and Belavsky. The sequel to this is that no conclusions relating to the amount of sludge which forms in practice can be drawn from the amount of " insolubles " as determined by the official method of tanning material analysis.

The cooling of the tan solution below 18° C. led to the formation of considerable amounts of sludge which partly re-dissolved when the temperature was allowed to rise again. Clarified extracts are less sensitive in this respect than those which have not been clarified. Alterations in the amounts of insolubles in a number of commercial extracts were recorded in a number of tables and diagrams.

Damage by Metallic Iron

V. Kubelka, V. Nemer and S. Zuravler presented a paper on " Damage to Vegetable Tanned Leather by Metallic Iron," dealing with the effect of grease in the leather. The papepr was occupied with the question as to how the various fats which are applied to leather react with metallic iron in the presence or absence of leather Iron filings were in one case mixed with the fat under investigation and in another case with a paste of this fat and an equal weight of powdered leather. These mixtures were stored for various periods of time up to 75 days, occasionally melted and remixed, etc. The mixtures were then analysed for the amount of dissolved iron in the grease and in the leather, also the free fatty acid content, etc.

The following results have been obtained so far: (1) The presence of leather powder (from perfectly acid-free leather) in a grease brings about in all cases a strongly corrosive action of the grease upon iron. (2) Mixtures of leather powder with leather greases in whose preparation strong acids were used and which as a consequence contained traces of acid, dissolve considerable amounts of iron which is absorbed for the greater part by the leather. In these circumstances a technical tallow was found to be strongly corrosive. This fat contained traces of strongly-ionised acids. The leather heated with this had an iron content of 1.6 per cent. (3) Considerable dissolving of iron takes place with those greases which contain larger amounts of unsaturated fatty acids or oxy-fatty acids, *e.g.*, degras, many fish oils, etc. The iron content of a leather powder used in the experiment with degras was over 2.5 per cent. after 75 days' contact. (4) Saturated fatty acids, also hydrocarbons, provided these are free from strong acid, do not dissolve iron. In the investigation, a number of samples of pure stearine and paraffin wax were used, and these after 75 days' action had not dissolved even a trace of iron. The leather powder used in these tests contained the same amount of iron at the end of the test as at the beginning, *i.e.*, 0.02 per cent.

The Chemistry of Tanning

Dr. D. Jordan Lloyd, in a paper on " Recent Theories of the Chemistry of Tanning," said that X-ray examinations of collagen and of good and poor quality sole leathers showed that tanning occurs at the active centres of the side chains of the collagen molecules and influences the side chain spaces of the bundles of parallel molecules that go to build up the collagen fibril (or fibre). If the tanning processes weaken or affect the collateral forces directly binding the backbones of these bundles of collagen molecules, or the longitudinal forces down the backbones of the molecules, the leather is of poor quality. All this inter and intra molecular forces can, of course, be affected by the pre-tanning processes such as those which have been used for curing hidesand skins and also those employed in beamhouse work.

A paper on " Influence of the *p*H of Suspender Liquors on the Fixation of Tannin," was presented by G. Rezabek, who said that a series of tests had been carried out on the suspender liquors of a tannery, the *p*H values of which were adjusted with acetic acid on the acid side and with caustic soda on the alkaline side. Series of suspender liquors were thus made with increasing tannin concentration and at a uniform *p*H. The tannin fixed by hide powder was estimated by determining the increase in weight of the thoroughly washed powder, and also by the determination of nitrogen, *i.e* , the degree of tannage. From the results obtained it is concluded that at *p*H 4 hide powder fixes about one-sixth to one-quarter more tannin than at the natural *p*H of the liquors, which latter were *p*H 5 or 6. Tannage in alkaline medium, *i.e.*, *p*H 8 gave approximately the same tannin fixation as in the non-adjusted liquors.

Dr. A. Jamet, in a paper on " Determination of Formic Acid in Lactic Acid," said that owing to differences in price, lactic acid is liable to adulteration with formic acid, and the total acidity of such mixtures is about equal to that of 50 per cent. by weight lactic acid. If valuation is based on total acidity titration alone, such adulteration will pass unnoticed. The author suggested that any sample with a sharp odour should be tested for formic acid by the silver nitrate and mercuric chloride tests, and then a quantitative estimation made. For this latter a steam distillation method was proposed, and the volatile acids expressed as formic acid. The apparatus used was described and also the results obtained using (a) commercial 50 per cent. lactic acid, (b) commercial 90 per cent. formic acid, and (c) mixtures of these. It was possible to determine the volatile acid to within 1 per cent. error, and that in mixtures containing a very high proportion of formic acid, the results were practically correct. An estimation of the volatile acid was first made, and based on the figure found, a fresh determination made after adding a known calculated amount of pure lactic acid. Under these conditions a more complete separation of volatile and non-volatile acids is possible.

Tungsten Tanned Leather

Dealing with " Tungsten Tanned Leather," Professor Dr. V. Casaburi and Professor Dr. E. Simoncini said tungsten salts, under certain conditions of temperature, etc., decompose to give complexes of the hetero polyacquo type. The authors have prepared some complexes of pure tungsten and some of its boron, silicon, phosphorous and sulphur derivatives, and all have the common property of precipitating albuminoids to give organo-metallic complexes, the exact composition of which are not yet known. These compounds act as tanning agents towards hide substance. They penetrate pelt rapidly and give a good heavy leather. Many samples of sole and belting leather have been made by this method, as well as several types of light leather, and all with satisfactory results from the technical point of view. Chemical analysis and physical properties of the leathers show a close relationship between tungsten and vegetable tanned leather.

The mordanting properties of the complex tungsten salts have also been investigated. Skins pickled with tungsten and chrome tanned, or tanned with chromium and mordanted with tungsten fix basic colours quantitatively and in a very uniform manner. Also in the production of sole leather if pickled or mordanted with tungsten it absorbs water uniformly and dries again perfectly.

Sulphite Cellulose Test

A new method for testing for sulphite cellulose in vegetable tanning extracts was described by C. van der Hoeven, who said the usual methods for testing for sulphite cellulose in vegetable tanning extracts are not satisfactory since they give, in all cases, a positive reaction in the presence of synthetic tannins. The new method, which, within certain limits, also gives quantitative results is based on the following: Sulphite cellulose extracts contain lignin as its principal constituent, the lignin being present either as a sulphonic acid or a salt of this acid. A characteristic feature of lignin is its content of methoxyl groups which can be separated as methyl alcohol by a short heating with 72 per cent. sulphuric acid. The methyl alcohol which is distilled off can be determined colorimetrically by means of its sensitive reaction with a fuchsin solution decolorised by sulphur dioxide according to Deniges method as improved by Fellenburg. The Lovibond tintometer can be used in measuring the intensity of the blue to red colours produced.

The results of the test were expressed as Lovibond units (blue and red) for 400 mgm. dry extract. The important points to decide were to what extent the test is affected by vegetable tanning extracts containing no added sulphite cellulose, and whether synthetic tans gave methyl alcohol when subjected to the acid distillation above. The results showed that vegetable tanning extracts in general give small amounts and in some cases traces of methyl alcohol, but that additions of very little sulphite cellulose preparations markedly increased the yield of alcohol. The method was found to be approximately quantitative for a number of commercial extracts to which had been added known amounts of sulphite cellulose. The best known synthetic tannins did not yield methyl alcohol by the distillation test, so that the method differentiates between sulphite cellulose and synthetic tannins.

Some Mixing and Kneading Machinery

Modern Plant at the Bakers' Exhibition

JUDGING by this year's exhibition, which opened at the Royal Agricultural Hall on September 7, and continued until September 13, British bakers and confectioners should be proud craftsmen for not only is theirs a foremost and vital industry of the land, but they have now reached the leading position in their products. By general consent it is now agreed that British bread and confectionery are by far the best and cheapest and display the greatest skill of any produced anywhere in the world. The ever-increasing importance of the trade is demonstrated in the remarkable revelation that, in addition to the direct trade displays, over a hundred interested industries are showing an amazing variety of products and "bigger business making" suggestions. Firms from every part of Great Britain producing many kinds of machinery, apparatus and appliances and trade-aids are demonstrating their latest inventions. Among these are machines that make four thousand loaves per hour; pie and tart machines that cut out several shapes at the rate of two thousand per hour; cake mixing plant with eighty quart capacity and bread-kneaders with huge steel arms that work in their gigantic way with exactly the same motion that grandmother's arms made in the home-baking days and which is half the secret still of successful baking.

The C. O. Ericsson Engineering Works, Ltd., exhibit an interesting new air-whip, which aerates the mixture by means of compressed air, at the same time as it is beaten. The machine compresses its own air, but if a cylinder is attached to the compressed air lead, carbonic acid gas can be bubbled through the mixture just as easily.

The mixing of dough is a very complicated operation. The yeast feeds on the sugars of the flour and other ingredients and in so doing the yeast enzymes change the complicated sugars to simple ones. Incidental to this process, carbonic acid gas and alcohol are produced. Some of the carbon acid gas combines with water to form a weak solution of carbonic acid. In other ways, acetic and lactic acid are produced within the dough. All of these have their effect on the gluten, which, being assisted by other yeast, malt and flour enzymes, causes the ageing of the dough as the temperature increases. In time, the yeast absorbs all food adjacent to it and fermentation ceases, although the dough is not ripe, for all the proteins have not been acted upon. Consequently the dough needs to be punched, so that yeast is again brought in contact with fresh food and fresh protein and the ageing process proceeds to full maturity.

In the patent mixing and kneading machine, shown by the Artofex Engineering Works, Ltd., there is a unique action of the two mixing basins in the rotating bowl. The left-hand arm is designed in such a way that it practically touches the sides and bottom of the bowl, thus making absolutely sure that every particle of the ingredients is brought under the direct mixing action of the two arms. In operation these two arms move closely over one another in their elliptical paths, and only by such action is it possible to obtain thorough shaking-in of the flour and water, maximum gluten development and the consequent highest possible water absorption. Not only are all these ingredients perfectly blended with each other, but the triple mixing and kneading action is so thorough that in spite of its gentleness stiff doughs are obtained with unusually high water absorption. The arms of the machine give a mixing, lifting and stretching action. They are made of forged steel coated with tin; the bowl of the machine is made from sheet steel completely coated with tin of 99 per cent. purity. Grease lubrication is used.

Bauxite Cement in India

A New Manufacturing Process

MR. K. C. ROY CHOWDHURRY, of the Bihar Lime and Cement Co., Ltd., has evolved an economic process of manufacturing bauxite cement in India, which is an improvement on the process adopted by Dr. Cyril Fox, of the Geological Survey of India. Dr. Cyril Fox utilised a special furnace which permitted the production of super-cement and metallic iron at the same time by utilising low-grade bauxite containing a high percentage of ferric oxide and lime stone.

Mr. Chowdhurry's object has been to effect a saving in the capital cost of plant as well as in the cost of manufacture of alumina cement. The invention is based on the discovery that intimate chemical combination of lime with alumina of bauxite takes place, if the mixture of lime and raw bauxite, after fine grading, is subjected to pressure of not less than 8,000 lb. per sq. in. and calcined in ordinary vertical kilns. The baked mass is mono-calcium aluminate cement. For instance, 40 parts of unslaked lime containing at least 80 per cent. of calcium oxide are hydrated and mixed most intimately with 60 parts of raw bauxite containing at least 45 per cent. of alumina, and pulverised to a fineness of 150 mesh per sq. in. A small quantity of silica is usually present in the raw materials and may be used along with them provided it does not exceed 5 per cent. in the total mixture.

The mixture is shaped and moulded into bricks or tiles in a press, which exerts a minimum pressure of not less than 8,000 lb. per sq. in. The pressed blocks, bricks or tiles are drawn out from the bottom of the kiln, air cooled, and are then broken into lumps. These lumps are subsequently pulverised to a fineness of 200 mesh. The novelty of the process is that the lime bauxite raw mixture has to be ground to extreme fineness and pressed into blocks, bricks or tiles at a pressure of from 8,000 to 10,000 lb. per sq. in.

Recent experiments have confirmed that hydraulic lime may be substituted for unslaked lime in the manufacture of alumina-cement. The abundance of bauxite and limestone in Bihar and C.P., not far from the coal fields, will make industrialists give their attention to the manufacture of this new cement.

Practical Hints on Patents

A Difficult Subject Explained

IT is an acknowledged fact that a continuous stream of inventions are necessary for a trade revival, and a trade revival means a reduction in the unemployment figures. However, the embryo inventor has little encouragement to invent, unless he can be sure of financial gain. He can only make money from his invention if it is adequately protected. The simpler the device, the easier it is to copy it and full copyright is difficult and expensive to obtain.

It is here that Mr. M. E. T. Gheury de Bray's "Practical Hints on Patents," which is issued by The Imperial Patent Service, First Avenue House, High Holborn, and is now in an entirely revised and enlarged fourth edition, will be so useful. He knows his subject thoroughly and what is more he can make himself intelligible to the layman. He shows how expenditure may be cut down without losing any proprietary rights over the device patented. The whole is written in concise form and simple language.

New Koppers Ovens for France

THE seven batteries of Koppers medium temperature ovens now in operation are producing well over 1,000 tons of open-grate coke per day. The first of these batteries was erected for the Compagnie des Mines de Bruay in the Pas-de-Calais coalfield, France, in 1931 and consisted of 25 ovens. The success of this undertaking led to the size of the plant being doubled in the following year. The sales of coke made in this installation have now increased so greatly that it has become necessary again to increase the size of the plant. Accordingly the Bruay Company has just placed with the firm of Koppers an order for a further 17 medium temperature ovens, which are to commence coke-making in the spring of next year. The size of the ovens is the same as that of the existing ovens, namely, 11 ft. 6 in. high, $13\frac{3}{4}$ in. wide and 36 ft. effective length. The capacity of the plant will by this addition be increased from some 400 tons of medium temperature high-volatile coke per day to 515 tons per day.

New Technical Books

SMITHSONIAN PHYSICAL TABLES. 8th Edition. Prepared by Frederick F. Fowle. pp. 682. Lord Baltimore Press, U.S.A.

The present edition of the Smithsonian Physical Tables entails a considerable enlargement. Besides the insertion of new data in the older tables, about 270 new ones have been added. Their scope has been further broadened to include many new tables relating to astrophysics, geophysics, meterology, geochemistry, atmospheric electricity, wireless, molecular and atomic data, etc. The volume has been kept to a handy size and the reader is referred to the International Critical Tables or to Landolt Börnstein's Physikalisch-Chemische Tabellen for more extensive information.

* * *

THE PRINCIPLES OF MOTOR FUEL PREPARATION AND APPLICATION. Vol. II. By Alfred W. Nash, M.Sc., F.C.S., and Donald A. Howes, B.Sc., Ph.D. pp. 523. Chapman and Hall, Ltd. 30s. net.

It is rather remarkable, in view of the great importance of the subject with which this work deals, that so few authoritative text-books have been devoted to it, and, indeed, this applies broadly to the subject of petroleum technology as a whole. It is very true that the astonishing development of new technique and the demand for new and improved products involving the rapid obsolescence of so many processes make it difficult to get anything but a fleeting glance of the march of progress. The authors have presented a work on the subject of motor fuels that contains not only very complete descriptions of present-day technique, but includes also discussions of problems that will undoubtedly arise in the future. The basic attitude of the book is directed to the modern high speed, high efficiency, internal combustion engine which has revolutionised demands for motor fuel. The authors naturally and reasonably give very considerable attention to the compression ignition engine, a type of prime mover that is passing from infancy into a very healthy childhood. The general refining of motor fuels is treated in a thoroughly exhaustive way, and all the ancillary operations are discussed with a degree of completeness that has not hitherto been accorded them. There is not the slightest doubt that this work will be invaluable not only to the refiner and the oil industry generally, but to the consumer as well, and bring home to him some idea of the vast work and capital expenditure involved in maintaining at each wayside petrol pump a constant, standard and reliable supply of motor fuel.

* * *

THE HANDBOOK OF BUTANE-PROPANE GASES. 2nd Edition. Edited by George H. Finley. pp. 375. Western Business Papers, Inc., 810 South Spring Street, Los Angeles, California, U.S.A. $5.00 per copy.

The two years which have elapsed since publication of the original handbook have recorded many changes in production and marketing of the liquefied petroleum gases. In this short time extensive distribution has begun to open in Europe, South America and other sections. Petroleum refineries have supplemented natural gasoline plants at major sources of production. Use of liquefied gases as internal combustion engine fuel in motor trucks, buses, tractors and locomotives, as well as to stationary engines, has created a new and promising outlet for the industry's products. New fields of use and the many changes in practice which have evolved over the two-year period have demanded for this second edition of the handbook a considerably broader range of subject matter than that offered in the first edition. In its larger form the handbook now comprises 16 major chapters, nine of which are entirely new contributions. For their basic reference value several of the original chapters are retained in the second edition, but each has been amplified in important respects. In addition to covering internal combustion engine use, and the manufacture and physical properties of the refinery-produced liquefied gases, his edition presents significant new material on pressure vessels, temperature-volume correction factors, competitive fuel data and miscellaneous supplementary material. The chapter on central plants and that on bottled gas distribution include summaries of current practices in their respective fields, as reported through questionnaires circulated co-operating companies. The industry's response to these questionnaires has added materially to the usefulness of these sections. Two compilations which were of value in the first edition—the Directory of Central Plants, and the Bibliography—have been extended to include the past two years. As may be seen from the foregoing comments, the handbook, in its technical reference departments, and equally in its coverage of processes, equipment and operating experience, is now a much more complete product than was the pioneer edition. Credit for the improvement is shared by the contributing authors and the many individuals who have helped to shape the new contents. In a very literal sense the second edition is the industry's own work. Contributors have brought into the volume the direct experience of many companies; further than this, a broad view of their respective fields has led the authors to draw upon companies outside their own for information, making their contributions a cross section of current practice.

* * *

LIQUID FUELS. By Harold Moore, F.C.S. pp. 263. The Technical Press, Ltd. 21s. net.

In a commendable effort to keep his book within a small compass, the author has produced a work that is so elementary and patchy that it seems doubtful whether "Liquid Fuels" will appeal even to the engineers and chemists for whom it is designed. Perhaps the great bulk of technical workers who are not actually specialists will find it useful. We hope so: but all the statements must not go unchallenged. On page 104 the writer says "colour frequently has a relationship with the gum test, a yellow colour accompanying a high gum content." If Mr. Moore had studied some experimental work he would have found out that many samples of petrol having a very yellow colour have been found gum-free, while others which have been +25 Saybolt colour, or better, have contained large amounts of gum.

* * *

LES MATIERES COLORANTES ARTIFICIELLES, by Georges Martin. 212 pages. Armand Colin, 103 Boulevard Saint-Michel, Paris, 5. Paper, 10 fr. 50; bound, 12 fr.

An industry represented in Europe, America and Japan by capital running almost into astronomical figures and forced to spend vast sums upon laboratory research work cannot be adequately dealt with in 200 pages. What M. Martin (who writes with the authoritativeness expected of a director of the important Saint-Denis concern) has nevertheless succeeded in doing is to present the fundamentals of synthetic intermediates and dyestuffs manufacture with a lucidity which should go far to assist the callow student over the initial awkward hurdles—and also, one might add, gently break him in to the even more formidable advanced stages of theory and practice. French publishers have been pioneers in the sale of well-produced technical works at moderate prices and the present volume worthily maintains their reputation. In a second edition, the inexplicable omission of an index may possibly be rectified.

* * *

MOLYBDENUM STEELS. By J. L. F. Vogel, M.I.E.E., M.I.M.M., and W. F. Rowden. pp. 103. High Speed Steel Alloys, Ltd. 5s. net.

Modern demand for increased rapidity of transport by land, sea and air has necessitated the provision of materials of high physical qualities, so that weight may be decreased without loss of strength and safety ensured. The response to this demand has been alloy steel. This handbook deals fully with the three essential features to be observed in manufacturing alloy steel. These are the selection of the best alloy additions, the proper technique in making the steels, and the correct casting, forging, rolling and thermal treatment. The information contained in this book is probably known to most steel makers and consumers, but it may serve as a useful reminder of the necessity of maintaining the most constant care in the production of reliable products, especially as that all the tests quoted were obtained in commercial production and were not made upon specially-selected specimens.

CRUSHERS FOR STONE AND ORE. By W. T. W. Miller. Mining Publications, Ltd., pp. 234. 15s. net.

As the engineer in charge of the department in Hadfields, Ltd., for building and maintaining crushers, Mr. Miller is well qualified to write with authority on the subject. His practical experience in the design and construction of plants for the many and varied operations in which crushers are used has been most extensive, and trade in spare parts for crushers built by other makers has kept him in constant touch with the changes made by other manufacturers. The author has dealt very fully with the historical advance of crushers and it is interesting to note that one type owes its being to the genius of Edison. The principles that underlie various types of this machinery are laid bare in detail, and defects or advantages of any one type are shown up. The work contains, also, a very useful chapter on choosing a crusher. Mr. Miller has gone into all the points very thoroughly and has filled his pages with sound advice. His book should prove very useful to those engineers who use and maintain crushers, or to those quarry-owners or miners who are thinking of installing a plant but are dubious as to what machine would give them best results.

THE NITROGEN SYSTEM OF COMPOUNDS. By E. C. Franklin. pp. 339. Reinhold Publishing Coporation, U.S.A. $7.50

This volume is an "American Chemical Society Monograph" issued by the Chemical Catalog Company, Inc. Excepting fluorine, oxygen is the most powerfully negative of all the elements. Next to oxygen in the order of negativity stands nitrogen. Such being the case it is reasonable to say that the compounds of nitrogen, excepting the fluoride and oxides which belong respectively to the fluorine system and oxygen system, constitute a nitrogen system of compounds in the same sense that the compounds of oxygen have been assumed to make up an oxygen system. Nitrogen, with its high negativity, may be said to dominate all the compounds into which it enters excepting those with fluorine and oxygen. The object of this monograph is to bring to the attention of chemists the remarkable extent to which the compounds of nitrogen simulate in their properties and behaviour the analogous compounds of oxygen.

An Export Problem Solved

Adoption of a Mark of Selection

ONE of the most difficult problems of the British manufacturer selling abroad is that of unauthorised sales of his product in the territory. The appointment of sole selling agents or concessionaires does not meet this problem. Agents abroad are liable to complain of goods reaching their market through unauthorised channels and selling through retail shops at prices less than those agreed between themselves and the manufacturer. Something like chaos usually results and a corresponding amount of friction is set up. As an outcome of this friction a promising agency may be rendered largely ineffective. This practice of undercutting is made possible usually by one of two conditions. There may be fluctuations in the rates of exchange, or there may be a difference between the British wholesale price at home and the territorial price agreed between the manufacturer and his concessionaire abroad. This difference would be arranged to subsidise the advertising necessary to establish the product in a new and possibly a difficult market, but it clearly leaves a loophole for unscrupulous undercutting by unauthorised traders. The problem is not confined to the British exporter and his foreign concessionaires. It is equally familiar to concessionaires in this country acting for principals abroad Particularly is this true of the perfumery and champagne industries.

Restrictive Conditions

In this country attempts have been made to cope with the difficulty by a form of contract binding purchasers against re-sale for export. This has not proved satisfactory. Purchasers seldom care to buy under restrictive conditions, and are very apt to object to the actual signing of a restrictive contract. Even where this is not the case there is a further difficulty in securing legal redress in case of infringement of contract. It may be feasible, for example, to sue the first purchaser provided the manufacturer has been successful in tracing and proving direct shipment abroad. But where the first purchaser sells to a second buyer who then exports the goods it is not probable that either party could be attacked in law with hope of success.

The adoption of a second mark—this being a mark of selection—is suggested as the final means of circumventing the undesirable activities outlined in the previous paragraphs. This mark would be preferably a device mark and it would be registered in the country of origin as the property of the manufacturer or the exporter. Concurrently it would be registered in the various foreign markets concerned as the mark of selection of the respective sole selling agents or concessionaires. The mark should appear on every package whether for sale in this country or abroad. In case of trouble it would then be possible for the concessionaire to take steps to sue for the infringement of his registered trade mark. Such action would in all probability lead, at some stage of the proceedings, to the disclosure of the name of the consignor. This in turn would provide the producer of the goods with cause for action against the offending exporter in the country of origin of the goods.

Seven Important Points

If this plan is to be made fully effective a number of points must be kept in mind, all of them important: (1) The mark chosen must have no association with any of the manufacturer's existing marks; (2) the mark must be original and distinctive. Marks anticipated in this country and in other countries should be searched before the proposed mark is adopted and an application for registration made; (3) registration of the mark in this country, as the property of the manufacturer, must be concurrent with its registration in the respective foreign markets in the names of the respective sole selling agents or concessionaires, as their mark of selection; (4) sole selling agents or concessionaires must in every case complete an agreement containing (a) an acknowledgment that the mark is a mark of selection in his market and held by him for that purpose only, and (b) an undertaking on the part of the agent or concessionaire to assign the said mark of selection together with the goodwill therein to the British manufacturer or his nominee at any time when called on, or at the termination of his agency; (5) the mark must be added to every package whether the goods are for sale in this country or abroad. Failure on this point would nullify the scheme; (6) the mark must be placed upon the package in such fashion that any attempt to remove it would so damage the package as to make re-sale impossible; (7) as an additional precaution it is suggested that the foreign agent should seek the co-operation of the customs authorities at the principal ports in his country in order to gain early information of any attempt to ship into his territory goods bearing his mark but not consigned to him.

A scheme on these lines has been worked out by B. J.. Wildbore and Son, who will be pleased to give further information and advice to anyone who may be interested in the scheme.

THE Bleaching Powder Manufacturers' Guild, Japan, reports production during the first four months of 1935 for caustic soda at 23,566 metric tons and for bleaching powder at 21,610 tons, representing gains of 1,434 tons and 199 tons respectively, over the same period of 1934. It is also reported that the Japan Electrical Industrial Co., Ltd., has applied for a licence to erect a plant for the production of caustic soda and allied products. This plant will be erected in Kanagawa Prefecture and will have an annual capacity of 11,000 metric tons of caustic soda, 14,400 tons of hydrochloric acid, 2,880 tons of liquid chlorine, and 1,800 tons of bleaching powder.

The Chemical Age Lawn Tennis Tournament

To-Day's Finals at Dulwich

THE finals of the fifth annual CHEMICAL AGE Lawn Tennis Tournament will be played at the sports ground of Johnson, Matthey and Co., Ltd., at The Toll Gate, College Road, Dulwich, to-day (Saturday), commencing at 3 p.m. sharp. This is the second occasion on which Johnson, Matthey and Co., Ltd., have kindly placed their grounds at the disposal of the tournament. The matches to-day will be played on hard courts, which have been constructed since the 1933 tournament was held at Dulwich. The finalists are as follows:

Singles

Bruce, R. N. B. D
Gas Light and Coke Co., No. 1 Laboratory, Fulham, London, S.W.6. (Fulham 3531, Ext. 10.)

v

Haines, J.
Anglo-Iranian Oil Co., Ltd., Britannic House, Finsbury Circus, London. (National 1212.)

Doubles

Willshere, A. E., & Grape, L. F.
Borax Consolidated, Ltd., Regis House, King William Street, London, E.C.4. (Mansion House 8332.)

v

Haines, J., & Hawley, F. G.
Anglo-Iranian Oil Co., Ltd., Britannic House, Finsbury Circus, London. (National 1212.)

J. Haines won his singles semi-final on Wednesday evening, when he defeated his colleague and doubles partner, F. G. Hawley, by 5-7, 6-2, 7-5. The remaining doubles semi-final was played at Slough on Tuesday evening, when Haines and Hawley defeated F. R. O. Allen and R. A. J. Bennett (Nobel Chemical Finishes, Ltd.) by 6—1, 4—6, 6—0.

R. N. B. D. Bruce (Gas Light and Coke Co.), who will meet Haines in the final of the singles, defeated L. F. Grape (Borax Consolidated) in the semi-final by 2-6, 7-5, 6-3. This will be the first occasion on which a representative of the Gas Light and Coke Co. has figured in the finals. Hawley and Haines are the holders of the doubles cup and are playing in the singles for the first time this season. A. E. Willshere and L. F. Grape (Borax Consolidated, Ltd.) who will meet Haines and Hawley in the doubles, defeated V. J. Prosser and A. Baxter (John Haig and Co., Ltd.) in their semi-final by 6-2, 2-6, 6-3.

THE CHEMICAL AGE silver challenge cups will be presented to the winners of the singles and doubles respectively, and miniature trophies, given by Thomas Hill-Jones, Ltd., and Mr. W. Lloyd Willey, of the same firm, will go to the winners and runners up in each section of the tournament. Mr. Glavill Benn, a member of the board of Benn Brothers, Ltd., and son of Sir Ernest Benn, the chairman, will present the awards. Visitors are reminded that cars cannot be admitted to the ground and may not be left in Grange Lane (in which the entrance to the grounds is situated). A car park, with attendant, will, however, be provided in Union Road, a turning on the right of College Road, a hundred yards or so short of The Toll Gate.

Play will commence at 3 p.m. sharp, and visitors are invited to be in their seats by 2.45 p.m.

Key Industry Duty

Exemption Orders Under Review

THE question of the renewal of the Safeguarding of Industries (Exemption) No. 4 Order, 1934, No. 7 Order, 1934, No. 9 Order, 1934, No. 2 Order, 1935, No. 3 Order, 1935, and No. 4 Order, 1935, made under Section 10 (5) of the Finance Act, 1926, is now under consideration by the Board of Trade. The articles covered by these Orders, which exempt them from duty until December 31, 1935, are:—

Lamp-blown glassware:—Dolls' eyes.

Scientific instruments:—Integrators (planimeter type).

Fermentographs for measuring and recording carbon dioxide evolved during dough fermentation.

Vacuum tubes:—Mercury vapour rectifiers having mercury cathodes, of a capacity of more than 300 amperes, and having more than three main anode terminals; sealed cylindrical X-ray tubes having four windows; grid-controlled rectifiers of the cold cathode neon-filled type.

Compounds of rare earth metals:—Celtium oxide, dysprosium oxide, erbium oxide, europium oxide, gadolinium oxide, holmium oxide, lutecium oxide, neodymium oxide, praseodymium oxide, samarium oxide, scandium compounds, terbium oxide, thulium oxide, ytterbium oxide, yttrium oxide.

Synthetic organic chemicals, analytical reagents, other fine chemicals and chemicals manufactured by fermentation processes:—acid adipinic, acid dipropyl-malonic, acid filicic, acid oxalic, acid propionic, acidol (betain hydrochlorate), acyl derivatives of urea (acid isobutyl allyl barbituric, N-methyl-C-C-cyclohexenyl methyl malonyl urea, N-methyl-C-C-cyclohexenyl methyl malonyl urea-sodium, N-methyl ethyl phenyl malonyl urea, cyclohexenyl ethyl malonyl urea, sodium ethyl methyl butyl barbiturate), alcohol amido ethyl, amido guanidine sulphate, amidopyrin (pyramidon, dimethyl-amidoantipyrine), ammonium perchlorate, barbitone (veronal, malonal, malourea, acid diethyl barbituric, diethylmalonylurea, hypnogen, deba), bromural (dormigene), butyl esters (butyl methyl adipate), calcium gluconate (calcium glyconate), cellulose ethers (ethyl cellulose and methyl cellulose), chinoline (quinoline), chinosol, cocaine (crude), coryfin, cyclohexanol esters and alkyl cyclohexanol esters (methyl cyclohexanol methyl adipate), dial (acid diallyl barbituric), dicyandiamide, didial (ethyl morphine diallyl barbiturate), dimethyl sulphate, diphenyl, diphenyl oxide, elbon (cinnamoyl para oxyphenyl urea), ethyl esters (ethyl abietate), ethylene bromide, eukedal, furfural, germanium oxide, glycol ethers, guaiacol carbonate (duotal), holocaine, lead tetraethyl, lipoiodin, melubrin, mercury compounds (mercury sodium salicyl allyl amino o-acetate), metaldehyde, methyl anthranilate, methyl esters (oxymethyl para-oxyphenyl benzylamine methyl sulphate), methyl sulphonal (diethylsulphonemethylethylmethane, trional), methylene chloride, B-naphthol ethyl ether (nerolin), B-naphthol methyl ether (nerolin), nickel hydroxide, organo-arsenic compounds (copper methyl arsenate, 4-oxy-3 ethyl amino phenyl arsinic acid-n-methyl tetrahydro pyridine B-carboxylic acid methyl ester), orthoform, orthoform (new), phenazone (antipyrine, phenyl dimethylpyrazolone, analgesin, anodynine, dimethyl oxychinizin), phenetidine (para-), phloroglucine, phytin, piperazine (diethylene-diamine, dispermin), R. potassium chlorate, potassium ethylxanthogenate (potassium xanthogenate), potassium guaiacol sulphonate, R. potassium hydroxide (R. potassium caustic, R. potassium hydrate), R. potassium permanganate, pyramidon-veronal, quinine ethyl-carbonate, radium compounds, sajodin, salol (phenyl salicylate), salophen, strontium carbonate, strontium nitrate, sulphonal, synthalin, theocine (theophylline), urea (carbamide), and valyl.

Amorphous carbon electrodes over 3 feet long, the cross section of which exceeds 12 inches in both length and breadth with longitudinal slots exceeding 2 in. in width and 4 in. in depth.

Vanadium compounds:—Vanadium-silica compounds specially prepared for use as catalysts for sulphuric acid manufacture.

Communications should be addressed to the Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade, Great George Street, London, S.W.1, not later than October 9.

Letters to the Editor

Transparent Cellulose Wrapping

SIR,—In THE CHEMICAL AGE of August 31 you give some information on the output of transparent cellulose wrapping, and you also state that the chief producers are Courtaulds, Ltd., and that they are constructing a large new factory at Bridgwater, Somerset. Will you allow us to point out that this statement is not correct. The factory at Bridgwater is being built by British Cellophane, Ltd. Whilst it is true that Courtaulds, Ltd., have a substantial interest in the company, British Cellophane, Ltd., registered on January 1 this year, are responsible for the erection of the factory, and the manufacture of their transparent paper.—Yours faithfully,

BRITISH CELLOPHANE, LTD.,
N. W. HIGGINS, Secretary.

Nitrate Agreement Renewed

Control of World Sales and Prices

THE international nitrate agreement has been renewed for three years. The following statement was issued on Monday by Imperial Chemical Industries, Ltd.: "The agreements which were initialled last July in Scheveningen (Holland) by the groups representing the nitrogen industries of Belgium, Czechoslovakia, Germany, Great Britain, Holland, Italy, Norway, Poland, and Switzerland, have now been definitely signed by all parties. This has made it possible to conclude the arrangements between the European groups on the one hand, and the Chile nitrate industry on the other, and, accordingly, the agreement between these groups and Chile, which was initialled in July, has now been formally ratified in London by representatives of the parties. These agreements provide for the regulation and sharing, on approximately the same lines as hitherto, of sales between the parties in the world markets, but do not cover the United States of America. They also contain provisions for the regulation of prices, with due regard to the legitimate interests of agricuture. The agreements are deemed to have come into force on July 1, 1935, for a period of three years, but contain a provision for termination at the end of two years in certain circumstances."

The old agreement came to an end on June 30, and following negotiations in Europe for its renewal, the outline of an agreement was reached in July, and the discussions were transferred to London. On July 31 a Treasury order raised the United Kingdom tariff on various synthetic nitrogen products from 20 per cent. *ad valorem* to the specific rate of £4 per ton. This step was then stated to be due partially to "the problematical continuance" of international agreements. Although no details of the new pact are given, it is reported that Chile will receive an annual export quota of about 1,250,000 tons, an increase of 50,000 tons on the amount exported last year.

Science and Commerce

Sir Josiah Stamp Surveys the Situation

SPEAKING on "Science and Commerce," before the Norwich Chamber of Commerce on Monday, on the occasion of the visit of the British Association, Sir Josiah Stamp, president-elect of the Association, said commerce did not become scientific merely by adopting scientific and labour-saving devices, such as telephones and calculating machines, any more than medicine by changing from corked to screw-topped medicine bottles—it was the quality and aptness of the stuff that went into each that mattered. In manufacturing industry, science had made great strides, not only in its physical processes, but also by severe experimentation, in time and motion studies, in optimum working conditions, and the general range covered by the term "industrial psychology." In commerce—not the production of goods, but the estimation of the demand for them and its relation to the supply—the beginnings of a scientific attack were established.

Trade, unlike industry, was in such multitudinous hands, that advance must be slow and tentative, and probably two generations of education would be necessary before any considerable number attained the scientific outlook under competitive conditions.

Day-to-day trade could not be fully scientific while so many short-period elements remained uncertain. Natural conditions, harvests, etc., varied on the supply side; science itself continually injected new inventions which disturbed both supply and demand; political ideas affected markets and currencies; the growth of population varied, and with migration changed the direction of demand, while individuals were generally free to upset programmes by shifting their requirements at will. The various economic dictatorships, corporative states, new deals, etc., were, at bottom, attempts to get rid of the elements due to waywardness of producing and trading judgments; but without touching consumer judgments—a probable deadlock—and to predict or control as many of the elements in the situation as possible.

It was too soon to say whether they were really more scientific, because the interference with a free price mechanism which they involved, without any new automatic regulator of supply and demand, other than statistical tables, deprived the economic machine of a factor which had a truly automatic physical or mathematical character. The introduction of bureaucratic controls might mean misjudgments of a new order, different in character from aggregate individual miscalculations, transferring some economic maladjustments shown by producers' losses and workers' instability of employment to a general unseen subtraction from consumers' satisfactions, but making progress less rapid and less painful. Much would depend on the administrative machine. Individualistic commercial enterprise would be the last to be taken into this scope, but its fate depended upon its willingness to join in co-operative production of facts, meet common issues, and think collectively—in other words, to become scientific—mainly through the agency of chambers of commerce.

Paterson Engineering Co., Ltd.

Encouraging Prospects

PRESIDING at the 34th annual meeting of the Paterson engineering Co., Ltd., in London on August 22, Mr. W. Paterson said that since the last annual meeting the nominal capital had been increased to £200,000 by the creation of 100,000 new shares of £1 each, of which 75,000 were issued in January of this year as 5½ per cent. cumulative preference shares of £1 each. These were offered to, and entirely subscribed by, the ordinary shareholders. The purpose of this additional capital was to permit of undertaking certain schemes of expansion which were indicated as desirable at the last annual meeting. This should widen the scope of the technical activities, facilitate economies in production and manufacture, and assist in the extension of overseas developments, so yielding both directly and indirectly a greater return than can be secured from general investments. Other changes in the balance sheet as compared with last year were mainly due to increased trading activity. Stock and work in progress and sundry debtors showed an aggregate increase of £30,000, whilst trade creditors increased by £11,000 and cash received on uncompleted contracts by £10,500. The accounts showed aggregate earnings to the credit of profit and loss account £22,487 as against £19,704 for the previous year. Of this sum £4,000 had been set aside to cover the development expenses of an overseas subsidiary company.

Last year the partial cessation of waterworks development was referred to, but some improvement was noted in the opening of the new financial year. The amelioration then forecast had been maintained, and showed signs of further improvement. The period since the closing of the accounts showed a definite increase in the volume of new business secured, and future prospects were encouraging. There were also indications of better trading conditions in overseas markets, where normal development during recent years had been severely retarded by difficulties of internal and external finance. A plant for the sterilisation of water by means of ozone was recently installed. The development of this system had been made possible by advanced technical research and the economical production of electricity, and the acquisition of a licence for a Continental system of high technical merit promises interesting developments.

Personal Notes

MR. JOHN W. TURCAN, head of the firm of C. J. Turcan and Co., esparto merchants, Leith, has died at his residence, Murrayfield House, Edinburgh. He was well-known in the paper trade throughout the country and was a director of the North British Rubber Co., Edinburgh. He was also a member of the Leith Dock Commission.

MR. EDWARD L. DOHENY, the prominent American oil magnate, whose holdings in the Tampico-Mexico field were among the greatest in the world, died at Los Angeles on September 2. He was one of the leading figures in the notorious Teapot Dome Oil case, being indicted in 1924 for conspiracy to defraud the Government. He was acquitted on both charges. Mr. Doheny was much interested in Irish politics, being a supporter of Mr. de Valera's party.

DR. KURT MENDELSSOHN, who came to Oxford two years ago from Berlin University, and has been engaged in low-temperature research work with Professor Lindemann, of Christ Church, Oxford, had his right hand seriously injured on Monday while working at the Clarendon laboratory. He was removed to Radcliffe Infirmary. He was working at low-temperature research and at the time of the accident he was testing the apparatus. All precautions had been taken, but a metal tube containing hydrogen burst. Professor Lindemann was away on holiday. Several members of the staff were there, but none of them was injured.

DR. JAMES ROBERTSON RIDDELL, of Bearsden (Dumbartonshire), who was a pioneer in X-ray work, has left personal estate in Great Britain to the value of £11,065.

MR. B. WILSON HAIGH, formerly of Barnsley, has been elected to represent the European constituency on the Bihar and Orissa Legislative Council. The council consists of 106 members, and there is only one elected European. Mr. Haigh, who is a member of the Institution of Chemical Engineers and a founder-member of the Coke Oven Managers' Association, is at present joint honorary secretary of the Mining and Geological Institute of India. For some years he was manager of the Barnsley Main coking and by-product plant. He is now in charge of one of the biggest coking installations in India.

DR. C. F. MARBUT, principal assistant in charge of the division of soil survey in the United States Department of Agriculture, whose death from pneumonia is announced from Harbin, was one of the world's greatest and most active exponents of the young science of the soil. He took an active part in the recent International Soil Congress at Oxford as president of the section of soil classification and mapping. His best-known book, "The Vegetation and Soils of Africa," written in collaboration with Professor H. L. Shantz, was remarkable for the fact that Dr. Marbut had not visited Africa when the book was written. Yet the book remains the standard authority on African soils.

Continental Chemical Notes

Hungary

"VEGYI IPAR" reports the formation in Budapest of the Metal Oxide and Chemical Industry Co., manufacturers of zinc oxide and other pigments.

Denmark

MARBLE DEPOSITS with a thickness of 3,000 ft. have been located by a Danish expedition in Greenland. The find stretches along the north side of Umanak Fiord and is calculated to be capable of supplying the entire world's demand.

Russia

PRODUCTION OF SODIUM FLUORIDE for the wood-impregnating industry is to be increased to 25,000 tons per annum by the beginning of 1938, when it is hoped to expand the treating capacity of wood-impregnation works to 6.5 million cubic feet. Increased production is also planned for other wood-preservatives in the shape of creosote and peat-tar distillation products.

Czecho-Slovakia

MERCURY OUTPUT at the Mernik mines has now increased to a level covering the domestic demand. The May production fikure (reports "Die Chemische Industrie") is 826 tons

CULTIVATION of tannin-containing plants on an extensive scale is the latest enterprise of the Bata Works. In two to three years a good yield of tanning agents is anticipated, one of the plant being reported to contain over 27 per cent. tanning material in the roots.

Germany

ACTIVATED SILICA has been proposed by Klug (in "Die Mühle") as a means of destroying the corn weevil which has even resisted the action of hydrocyanic acid.

AN OIL PROSPECTING CONCESSION in Southern Bavaria has been granted to the Bavarian Mineral Industry Company of Munich. Preliminary borings will be completed this autumn.

OFFICIAL REGULATIONS relating to the sale of compressed dichlorodifluoromethane limit the capacity of containers to 1 kilogram liquid per 0.89 litres volume. All containers must pass an initial pressure test of at least 13 kilos per square cm. before approval.

MESOTHORIUM RAYS are being applied in place of X-rays to detect possible welding faults in steel oil tanks. These rays were found to penetrate thicknesses of steel which prevented passages of X-rays.

NON-SKIDDING RUBBER SURFACES are claimed to result from incorporation of the rubber with 10 to 30 per cent. of hard granular particles (*e.g.*, quartz) previously coated with a viscous vehicle made up of glycerine and a heavy metal oxide (German Pat. 612,697).

Far Eastern Chemical Notes

China

A SHANGHAI REPORT refers to the contemplated erection of a rayon factory in Canton where mulberry tree wood would be used as the raw material.

Japan

INCREASED DEMAND for urea is reported and the Sumitomo Chemical Industry Co. is now turning out 8 tons per month.

FOLLOWING TRIALS extending over 18 months the Japanese Soda Co. has now decided to commence manufacture of tartaric acid in an initial monthly output of 20 tons.

POLYMERISATION OF SARDINE OIL in a hydrogen atmosphere at 280° to 290° C. is reported by K. Kino (Journal of the Society of Chemical Industry, Japan, 1935, page 77) to yield products free from fish smell which do not dry even in the presence of 1 per cent. cobalt linoleate.

OWING TO THE STEADILY INCREASING DEMAND for formic and oxalic acids, the Yedogawa Kogyosho is extending its Osaka works with a view to raising the annual output to 2,500 tons of each acid. The present annual outputs (according to the Chemische Industrie) are 700 tons formic acid and 500 tons oxalic acid.

A STUDY of the high pressure hydrogenation of soya bean oil in the presence of copper-chromium catalyst by Sinozaki and Kubo (J. Soc. Chem. Ind., Japan, 1935, p. 21B) reveals the formation of resinous esters when working at a temperature not lower than 390° C. Further heating to 410° F. leads to complete decomposition of these esters with formation of hydrocarbons of higher molecular weight, while still further heating at 450° C. yields a light oil (specific gravity 0.74) in a yield of 70 per cent.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THERE are no price changes to report this week in the markets for general chemicals. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

LONDON.—Little change of importance has occurred in chemical markets, and prices on the whole are unchanged. The coal tar products market remains firm, and there is little change in prices to report from last week.

MANCHESTER.—Although the holiday season is practically at an end, somewhat patchy conditions have been experienced on the Manchester chemical market during the past week. Whilst in some quarters a moderate flow of new business has been reported a number of traders state that they have met with little or no increase in activity compared with the average week in August. Apart from the usual flow of prompt transactions, trade is expected to run on relatively modest lines during the next week or two, whilst shortly increased interest will be displayed in year-end contract matters. In the meantime, there is a fairly regular flow of specifications against contracts and from the point of view of consumption the position is improving if anything. Apart from the market for the by-products, where here and there the tendency of prices remains easy, values of chemicals as a whole keep up and there is a feeling that any changes in the near future are likely to be upward rather than downward.

SCOTLAND.—There has been a steady day-to-day demand for chemicals for home trade during the week, and rather more inquiry for export. Prices generally continue very firm at about previous figures with no actual alterations to report.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech., 80%, £38 5s., d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £25 10s. per ton; crystal, £26 10s.; powdered, £27 10s.; extra finely powdered, £29 10s. packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. SCOTLAND: Crystals, £26 10s.; powder, £27 10s.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11¾d. per lb. MANCHESTER: 11¾d. to 1s. SCOTLAND: 11¾d.

ACID, CRESYLIC.—97/100%, 1s. 5d. to 1s. 6d. per gal.; 99/100%, refined, 1s. 9d. to 1s. 10d. per gal. LONDON: 98/100%, 1s. 5d. f.o.r.; dark, 1s.

ACID, FORMIC.—LONDON: £40 to £45 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works. SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £54 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. SCOTLAND: 1s. 0¼d. less 5%. MANCHESTER: 1s. 0¾d. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £34 per ton, c.i.f. U.K ports.

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 3d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC.—IONDON: £16 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £22 to £23, ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—LONDON: £10 10s. per ton. SCOTLAND: £10 10s. to £10 15s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 to £9 5s.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—3s. 4d. to 3s. 8d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£31 to £33 per ton, drums extra.

CARBON BLACK.—3¾d. to 4¾d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3¼d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £3 16s. 6d. net.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £25 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34 10s.; brown, £32 10s.

LEAD NITRATE.—£28 to £29 per ton.

LEAD, RED.—SCOTLAND: £24 to £26 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £36 10s.

LITHOPONE.—LONDON: 30%, £16 to £17 per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—6¾d. to 7¼d. per lb. to December 31.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £38 10s.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5%, d/d U.K. Ground, 5¼d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £37 10s.

POTASSIUM CHROMATE.—6¼d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. crystals, 10d. to 10½d. MANCHESTER: B.P., 11¾d. to 1s.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8¾d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8¾d. ex store. MANCHESTER: Yellow, 8¼d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. SCOTLAND: Large crystals, in casks, £36.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£21 10s. per ton. LONDON: £22. SCOTLAND: £20 15s.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. Anhydrous, 5d. per lb. LONDON: 4d. per lot less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash, £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 10s. per ton. SCOTLAND: 3¾d. per lb.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.

SODIUM META SILICATE.—£14 per ton, d/d U.K. in cwt. bags.

SODIUM IODIDE.—B.P., 6s. per lb.

SODIUM NITRITE.—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.

SODIUM PERBORATE.—10%, 9¼d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. to 5½d.

SODIUM SILICATE.—140° Tw. Spot, £8 per ton. SCOTLAND: £8 10s.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material, £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid, 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.

SODIUM SULPHITE.—Pea crystals, spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.

SULPHUR.—£9 10s. to £9 15s. per ton. SCOTLAND: £8 to £9.

SULPHATE OF COPPER.—MANCHESTER: £14 2s. 6d. per ton f.o.b.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 4s. 5d. to 4s. 7d. per lb.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.

ZINC SULPHIDE.—10d. to 11d. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 6¾d. to 7¼d. per lb.; crude, 60's, 1s. 1½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 6½d. to 6¾d. per lb.; crude, 2s. per gal SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

ACID, CRESYLIC.—90/100%, 1s . 8d. to 2s. 3d. per gal.; pale 98%, 1s. 5d. to 1s. 6d.; according to specification. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 3½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 6d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 5½d. to 5¾d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4½d.; heavy, 4¼d. to 4½d.

NAPHTHA.—Solvent, 90/100%, 1s. 5d. to 1s. 6d. per gal.; 95/160%, 1s. 6d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4½d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PITCH.—Medium soft, 33s. to 35s. per ton. LONDON: 35s. per ton, f.o.b. East Coast port. MANCHESTER: 31s. f.o.b. East Coast.

PYRIDINE.—90/140%, 5s. 6d. to 8s. per gal.; 90/180, 2s. 3d.

TOLUOL.—90%, 1s. 11d. to 2s. per gal.; pure, 2s. 2d.

XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Neutral quality basis 20.6% nitrogen £7 5s. per ton, less 9s. per ton for September delivery. This price of £6 16s. delivered to farmer's nearest station in 6-ton lots is the same price as for September, 1934. For delivery later than September no prices have yet been announced.

CALCIUM CYANAMIDE.—For September delivery £6 16s. 3d. per ton delivered in 4-ton lots to farmer's nearest station.

NITRO-CHALK.—The price for the new season has been announced at £7 5s. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.

NITRATE OF SODA.—The price for this product for the 1935/36 season has been announced at £7 12s. 6d. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.

CONCENTRATED COMPLETE AND NITROGEN PHOSPHATE FERTILISERS.—Up to the present no prices have been announced for the year 1935/36 and the June prices remain in force for prompt delivery.

Latest Oil Prices

LONDON, September 11.—LINSEED OIL was dearer. Spot, £25 per ton (small quantities); Sept. and Oct.-Dec., £22 10s.; Jan.-April, £22 12s. 6d., naked. SOYA BEAN OIL was quiet. Oriental (bulk), Sept.-Oct. shipment, £18 2s. 6d. per ton. RAPE OIL was quiet. Crude extracted, £31 per ton; technical refined, £32 10s., naked, ex wharf. COTTON OIL was firm. Egyptian crude, £24 10s.; refined common edible, £28 10s.; and deodorised, £30 10s., naked, ex mill (small lots £1 10s. extra). TURPENTINE was quiet. American, spot, 46s. 9d. per cwt.

HULL.—LINSEED OIL, spot, quoted £23 per ton; Sept., Oct.-Dec., and Jan.-April, £22 12s. 6d. COTTON OIL, Egyptian, crude, spot, £25 10s.; edible, refined, spot, £27 10s.; technical, spot, £27 10s.; deodorised, £29 10s., naked. PALM KERNEL OIL, crude, f.m.q., spot, £18 10s., naked. GROUNDNUT OIL, extracted, spot, £32 10s.; deodorised, £35 10s. RAPE OIL, extracted, spot, £30; refined, £31 10s. SOYA OIL, extracted, spot, £23; deodorised, £26 per ton. COD OIL, f.o.r. or f.a.s., 25s. per cwt. in barrels. CASTOR OIL, pharmaceutical, 42s. per cwt.; firsts, 37s.; seconds, 34s. TURPENTINE not quoted.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BLEACHERS' ASSOCIATION, LTD., Manchester. (M., 14/9/35.) Reg. Aug. 31, substituted security supplemental to Trust Deeds dated Nov. 21, 1901, etc.; charged on lands at Halliwell, etc. *£2,250,000. July 11, 1934.

EUCOS PRODUCTS, LTD., London, N.W., mfrs. of chemical preparations, etc. (M., 14/9/35.) Reg. Sept. 2, £1,000 deb., to Mrs. F. Kaye, 36 Buckingham Gate, S.W.; general charge.

FILTRATORS, LTD., London, W.C. (M., 14/9/35.) Reg. Aug. 30, £1,000 debs., part of £20,000 already reg., *£11,000. Jan. 12, 1935.

MACROME, LTD., Birmingham, metallurgists, etc. (M., 14/9/35.) Reg. Aug. 29, charge to Westminster Bank, Ltd., securing all moneys due or to become due to the Bank; charged on factory and land at Berkeley Road East, Hay Mills.

Satisfactions

DENT, SONS AND CO., LTD., Harrogate, tar distillers, etc. (M.S., 14/9/35.) Satisfaction reg. Aug. 30, of deb. reg. Jan. 23, 1923.

W. AND J. GEORGE, LTD., Birmingham, chemical apparatus mfrs., etc. (M.S., 14/9/35.) Satisfaction reg. Aug. 31, £2,500, outstanding July 1, 1908.

Inventions in the Chemical Industry

Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Complete Specifications Open to Public Inspection

RECOVERY OF ACID GASES, process and apparatus.—G. J. Horvitz. Feb. 28, 1934. 10073/34.

EXPULSION OF ACID GAS from a solution containing a soluble acid salt of the acid gas, apparatus.—G. J. Horvitz. Feb. 28, 1934. 10074/34.

INDIFFERENTLY REACTING PHOSPHATIC FERTILISERS, production.—Kali-Forchungs-Anstalt Ges. Feb. 28, 1934. 1983/35.

MINERAL OIL, refining.—Aktiebolaget Separator-Nobel. Feb. 27, 1934. 16255/35.

DYESTUFFS OF THE ANTHRAQUINONE SERIES, manufacture.—Soc. of Chemical Industry in Basle. Feb. 27, 1934. 6266/35.

METHODS OF AND ALLOY FOR DEOXIDISING SILICON STEEL.—British Thomson-Houston Co., Ltd. March 1, 1934. 6382/35.

CELLULOSE DERIVATIVES, manufacture and treatment.—British Celanese, Ltd. March 2, 1934. 6608/35.

Specifications Accepted with Date of Application

LIQUID FUEL, manufacture.—A. Roberts and C. W. Smith (legal representatives of A. A. Roberts, deceased). June 16, 1934. 434,109.

PROCESS FOR OBTAINING CONSTITUENTS of the atmosphere with a higher boiling-point than oxygen.—Vereinigte Glühlampen und Electricitäts A.-G. July 15, 1933. 434,193.

PROCESS FOR OBTAINING RARE GASES possessing a higher boiling point than oxygen.—Vereinigte Glühlampen und Electricitäts A.-G. Jan. 23, 1934. 434,194.

SULPHONIC ACIDS of aliphatic amino ethers of high molecular weight, production.—E. Waldmann and A. Chwala. Oct. 7, 1933. 434,358.

ORTHO-DISAZO DYESTUFFS insoluble in water, manufacture.—I. G. Farbenindustrie. Feb. 2, 1933. 434,416.

MONOAZO DYESTUFFS.—Imperial Chemical Industries, Ltd., A. H. Knight and H. A. Piggott. Feb. 23, 1934. 434,126.

AMINOPYRENESULPHONIC ACIDS.—I. G. Farbenindustrie. Feb. 25, 1933. 434,128.

DYESTUFFS OF THE DIBENZANTHRONE SERIES and their manufacture.—E. I. du Pont de Nemours and Co. Feb. 27, 1933. 434,132.

WATER-INSOLUBLE AZO DYESTUFFS, process for the manufacture. I. G. Farbenindustrie. Feb. 28, 1933. 434,209.

ACID WOOL DYESTUFFS of the anthraquinone series, manufacture.—I. G. Farbenindustrie. March 1, 1933. 434,429.

WATER-INSOLUBLE AZO DYESTUFFS, process for the manufacture. I. G. Farbenindustrie. March 1, 1933. 434,433.

CHROMIFEROUS DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. April 3, 1933. 434,139.

CARRYING OUT CATALYTIC REACTIONS with sulphide catolysts.—J. Y. Johnson (I. G. Farbenindustrie). April 7, 1934. 434,141.

METHOD OF COMMERCIALLY MANUFACTURING TIN OXIDE from the instantaneous combustion of a mixture of air and pulverised hot liquid metal.—M. Leroy, and H. Migeot (trading as Migeot Freres et Cie). June 6, 1933. 434,150.

UNSYMMETRICAL PENTACARBOCYANINE DYESTUFFS, manufacture.—I. G. Farbenindustrie. June 3, 1933. 434,234.

SENSITISING SILVER HALIDE GELATINE EMULSIONS, process.—I. G. Farbenindustrie. June 3, 1933. 434,235.

ATOMISATION OF HEAVY OILS.—G. Lucich. Nov. 16, 1933. 434,151.

LUBRICATING OILS.—J. Y. Johnson (I. G. Farbenindustrie). June 8, 1934. 434,295.

ABSORPTION OF NITROGEN OXIDES.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Aug. 11, 1933. 434,302.

WATER-SOLUBLE ORGANIC SULPHO COMPOUNDS, manufacture.—Deutsche Hydrierwerke A.-G. July 20, 1933. 434,452.

DESTRUCTIVE HYDROGENATION OF COAL dispersed in oil.—H. E. Potts (International Hydrogenation Patents Co., Ltd.). Aug. 21, 1934. 434,307.

AZO DYESTUFFS, manufacture and production.—I. G. Farbenindustrie. Sept. 6, 1933. 434,243.

DIAZO PREPARATIONS.—Soc. of Chemical Industry in Basle. Sept. 25, 1933. 434,158.

MERCURY BOILERS.—British Thomson-Houston Co., Ltd. Sept. 27, 1933. 434,386.

TAR PRODUCTS, particularly for road construction, manufacture. J. R. Geigy A.-G. Sept. 27, 1933. 434,159.

OXIDATION PRODUCTS from hydrocarbons, manufacture.—Standard Oil Development Co. Nov. 10, 1933. 434,311.

AMINOPYRENE-SULPHONIC ACID, manufacture.—I. G. Farbenindustrie and W. W. Groves. Feb. 26, 1934. 434,160.

THERAPEUTICALLY VALUABLE SATURATED ALCOHOLS from germinal gland hormones, production.—Schering-Kahlbaum, A.-G. Dec. 7, 1933. 434,390.

CONDITIONING GASES AND VAPOURS, method and apparatus.—H. G. C. Fairweather (Babcock and Wilcox Co.). Dec. 8, 1934. 434,457.

ELECTROLYTIC CELLS suitable for producing per-salts.—F. Krauss. Feb. 24, 1934. 434,165.

PHOSPHATES CONTAINING CITRIC ACID soluble or citrate soluble phosphoric acid compounds, production.—P. A. F. Bäumert and Elektro-Chemische Ges. Dec. 14, 1934. 434,255.

CARBON BLACK, production.—J. Dusek. July 18, 1934. 434,393.

ACTIVATED CARBON, manufacture.—F. Krczil. Jan. 21, 1935. 434,461.

ELECTROLYTIC PRODUCTION of beryllium.—Deutsche Gold-und Silber-Scheideanstalt Vorm. Roessler and Dr. G. Jaeger. March 11, 1935. 434,338.

NIOBIUM ALLOYS, production.—Electro Metallurgical Co. April 11, 1934. 434,400.

CONCENTRATED AQUEOUS SOLUTIONS of the follicular hormone, process for obtaining.—F. Hoffmann-la Roche and Co. A.-G. May 17, 1934. 434,406.

PROCESS FOR SUPPLYING LIQUID to electrolytic apparatus for decomposing water.—Maschinenfabrik Oerlikon. June 1, 1934. 434,348.

Applications for Patents

(August 22 to 28 inclusive.)

PURIFYING HORMONE PREPARATIONS, process.—Soc. of Chemical Industry in Basle. (Switzerland, Aug. 24, '34.) 23590.

CHLORATES, treatment.—Stockholms Superfosfat Fabriks Aktiebolag. (Sweden, May 8.) 24047.

METHACRYLIC ACID ESTERS, manufacture.—J. C. Woodhouse. 23884.

(August 29 to September 4 inclusive.)

CATHODE-RAY TUBES, ETC.—W. P. Anderson, Baird Television, Ltd., and C. Szegho. 24192.

APPARATUS FOR SEPARATING magnesium, beryllium, and like metals, which sublime from their ores and compounds.—H. A. Blackwell and W. L. Turner. 24623.

ISOCYANATES, manufacture.—A. Carpmael (I. G. Farbenindustrie). 24598.

ALIPHATIC ALCOHOLS, preparation.—A. L. Curtis. 24491.

HYDROFLUORIC ACIDS, manufacture.—E. I. du Pont de Nemours and Co., and J. C. Lawrence. 24503.

ANTHRAQUINONE DERIVATIVES, manufacture.—I. G. Farbenindustrie. (Germany, Aug. 29, '34.) 34191.

UNSATURATED ALIPHATIC, ETC., CARBOXYLIC ACID NITRILES, manufacture.—I. G. Farbenindustrie. (Germany, Sept. 4, '34.) 24566.

AZO DYESTUFFS, manufacture.—Imperial Chemical Industries, Ltd., and A. H. Knight. 24299.

PHTHALOCYANINE DYESTUFFS, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 24152.

DECOMPOSITION OF SUBSTANCES containing tungsten sulphide.—G. W. Johnson (I. G. Farbenindustrie). 24567.

AMMONIUM CHLORIDE, ETC., manufacture.—G. W. Johnson (I. G. Farbenindustrie). 24568.

WATER GAS, production.—Non-Poisonous Gas Holding Co., Ltd. (Switzerland, Aug. 9.) 24681.

PLASTIC RUBBER PRODUCTS, manufacture.—C. C. Smith and E. Williams. 24195, 24196.

MOTOR FUELS, production.—E. Solomon. 24647.

DISTILLATION OF COAL, ETC.—H. P. Stephenson. 24160, 24161.

ALIPHATIC ALCOHOLS, preparation.—H. P. Stephenson. 24491.

LIQUID-GAS SOLUTIONS, ETC.—H. P. Stephenson. 24492.

GAS CONVERTION PROCESS, ETC.—W. W. Triggs (Phillips Petroleum Co.). 24249.

SMOKE-CONDENSING, ETC., DEVICE.—C. D. Waldon. (Canada, Sept. 7, '34.) 24466.

APPARATUS FOR SUPPLYING GAS.—Wallace and Tiernan Co., Inc. (United States, Sept. 1, '34.) 24242.

Books Received

Chemical Engineering Group Proceedings. Vol. 16. 1934. London: Chemical Engineering Group. Pp. 125. 10s. 6d.

Die Bestimmungen der Wasserstoffionen-Konzentration (p). By Holger Jorgensen. Dresden and Leipzig: Theodor Steinkopff. Pp. 264. RM 15.

Transactions of the Institution of Chemical Engineers. Vol. 12. 1934. London: Institution of Chemical Engineers. Pp. 269.

Chemical and Allied Stocks and Shares

Current Quotations

THE following table shows this week's Stock Exchange quotations of chemical and allied stocks and shares compared with those of last week. Except where otherwise shown the shares are of £1 denomination.

Name.	Sept. 10.	Sept. 3.
Anglo-Iranian Oil Co., Ltd. Ord.	61/3	60/7½
,, 8% Cum. Pref.	35/9	36/-
,, 9% Cum. Pref.	36/9	37/3
Associated Dyers and Cleaners, Ltd. Ord.	1/10½	1/10½
,, 6½% Cum. Pref.	5/-	5/-
Associated Portland Cement Manufacturers, Ltd. Ord.	58/6	56/6
,, 5½% Cum. Pref.	27/6	27/6
Benzol & By-Products, Ltd. 6% Cum. Part Pref.	2/6	1/3
Berger (Lewis) & Sons, Ltd. Ord.	63/9	63/1½
Bleachers' Association, Ltd. Ord.	6/-	6/-
,, 5½% Cum. Pref.	10/-	10/-
Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.)	20/-	20/-
Boots Pure Drug Co., Ltd. Ord. (5/-)	49/3	49/3
Borax Consolidated, Ltd. Pfd. Ord. (£)	95/7½	97/6
,, Defd. Ord.	16/9	17/-
,, 5½% Cum. Pref. (£10)	£11/5/-	£11/5/-
,, 4½% Deb. (1st Mort.) Red. (£100)	£109	£109
,, 4½% 2nd Mort. Deb. Red. (£100)	£104	£104
Bradford Dyers' Association, Ltd. Ord.	8/9	9/4½
,, 5% Cum. Pref.	11/10½	11/3
,, 4% 1st Mort. Perp. Deb. (£100)	£88	£88
British Celanese, Ltd. 7% 1st Cum. Pref.	25/7½	25/-
,, 7½% Part. 2nd Cum. Pref.	22/-	21/6
British Cotton & Wool Dyers' Association Ltd. Ord. (5/-)	5/3	5/3
,, 4% 1st Mort. Deb. Red. (£100)	£91	£91
British Cyanides Co., Ltd. Ord. (2/-)	3/3	3/3
British Drug Houses, Ltd. Ord.	20/-	20/-
,, 5% Cum. Pref.	22/6	21/3
British Glues and Chemicals, Ltd. Ord. (4/-)	5/9	6/-
,, 8% Pref. (Cum. and Part.)	27/6	29/4½
British Oil and Cake Mills, Ltd. Cum. Pfd. Ord.	47/9¾	48/5¼
,, 5½% Cum. Pref.	26/3	26/3
,, 4½% First. Mort. Deb. Red. (£100)	£107/10/-	£107/10/-
British Oxygen Co., Ltd. Ord.	110/-	107/6
,, 6½% Cum. Pref.	33/1½	32/6
British Portland Cement Manufacturers, Ltd. Ord.	97/6	96/3
,, 6% Cum. Pref.	30/-	30/-
Bryant & May, Ltd. Pref.	67/6	67/6
Burt, Boulton & Haywood, Ltd. Ord.	21/3	21/3
,, 7% Cum. Pref.	27/6	27/6
,, 6% 1st Mort. Deb. Red. (£100)	£105/10/-	£105/10/-
Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5)	108/9	110/-
,, 4% 1st Mort. Deb. Red. (£100)	£96/10/-	£96/10/-
Calico Printers' Association, Ltd. Ord.	8/1½	8/1½
,, 5% Pref. (Cum.)	15/-	15/7½
Cellulose Acetate Silk Co., Ltd. Ord.	11/3	11/3
,, Deferred (1/-)	2/4½	2/4½
Consett Iron Co., Ltd. Ord.	10/10½	9/9
,, 8% Pref.	27/6	27/6
,, 6% First Deb. stock, Red. (£100)	£107	£107
Cooper, McDougall & Robertson, Ltd. Ord.	35/-	36/3
,, 7% Cum. Pref.	30/-	30/-
Courtaulds, Ltd. Ord.	56/3	54/4½
,, 5% Cum.	26/3	26/3
Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre-Pref.	25/-	25/-
,, Cum. 6% Pref.	28/9	28/9
,, 6½% Cum. Pref.	30/-	30/-
,, 7½% "A" Cum. Pref.	31/10½	31/10½
Distillers Co., Ltd. Ord.	93/-	92/6
,, 6% Pref. Stock Cum.	30/6	30/6
Dorman Long & Co., Ltd. Ord.	21/-	20/3
,, Prefd. Ord.	31/3	28/9
,, 6½% Non-Cum. 1st Pref.	23/9	21/3
,, 8% Non-Cum. 2nd Pref.	21/3	21/3
,, 4% First Mort. Perp. Deb. (£100)	£102/10/-	£102/10/-
,, 5% 1st Mort. Red. Deb. (£100)	£106	£107

Name.	Sept. 10.	Sept. 3.
English Velvet & Cord Dyers' Association, Ltd. Ord.	5/-	5/-
,, 5% Cum. Pref.	8/9	8/9
,, 4% First Mort. Deb. Red. (£100)	£70	£70
Fison, Packard & Prentice, Ltd. Ord.	38/1½	38/1½
,, 7% Non-Cum. Pref.	31/3	31/3
,, 4½% Debs. (Reg.) Red. (£100)	£106	£106
Gas Light & Coke Co. Ord.	27/6	27/9
,, 3½% Maximum Stock (£100)	£91/10/-	£91/10/-
,, 4% Consolidated Pref. Stock (£100)	£109/10/-	£109/10/-
,, 3% Consolidated Deb. Stock, Irred. (£100)	£92/10/-	£92/10/-
,, 5% Deb. Stock, Red. (£100)	£116/10/-	£116/10/-
,, 4½% Red. Deb. Stock (1960-65) (£100)	£114/10/-	£114/10-
Goodlass Wall & Lead Industries, Ltd. Ord. (10/-)	12/6	12/6
,, 7% Prefd. Ord. (10/-)	13/1½	13/1½
,, 7% Cum. Pref.	30/-	30/-
Gossage, William, & Sons, Ltd. 5% 1st Cum. Pref.	24/4½	24/4½
,, 6½% Cum. Pref.	30/-	30/-
Imperial Chemical Industries, Ltd. Ord.	34/9	34/9
,, Deferred (10/-)	8/3	8/4½
,, 7% Cum. Pref.	32/9	32/9
Imperial Smelting Corporation, Ltd. Ord.	14/9	14/9
,, 6½% Pref. (Cum.)	24/1½	24/1½
International Nickel Co. of Canada, Ltd. Cum.	$29¼	$29
Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5)	95/-	95/-
,, 4% Mort. Deb. Red. (£100)	£98/10/-	£98/10/-
Laporte, B., Ltd. Ord.	107/6	107/6
Lawes Chemical Manure Co., Ltd. Ord. (1/-)	8/1½	8/1½
,, 7% Non-Cum. Part Pref. (10/-)	10/-	10/-
Lever Bros. Ltd. 7% Cum. Pref.	30/9	30/9
,, 8% Cum. "A" Pref.	32/6	32/6
,, 20% Cum. Prefd. Ord.	76/10½	76/10½
,, 5% Cons. Deb. (£100)	£107	£109
,, 4% Cons. Deb. (£100)	£104	£105
Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-)	1/3	1/3
,, 6% 2nd Pref. (5/-)	6d.	6d.
,, 6% 1st Debs. (Reg.)	£58	£58
Major & Co., Ltd. Ord. (5/-)	7½d.	7½d.
,, 8% Part. Prefd. Ord. (10/-)	9d.	9d.
,, 7½% Cum. Pref.	1/6¾	1/6¾
Pinchin, Johnson & Co., Ltd. Ord. (10/-)	41/-	40/6
,, 1st Pref. 6½% Cum.	33/1½	33/1½
Potash Syndicate of Germany (Deutsches Kalisyndikat G.m.b.H.) 7% Gld. Ln. Sr. "A" and "B" Rd.	£67	£67
Reckitt & Sons, Ltd. Ord.	113/9	113/9
,, 4½% Cum. 1st Pref.	25/-	25/-
Salt Union, Ltd. Ord.	43/9	45/-
,, Pref.	46/3	46/3
,, 4½ Deb. (£100)	£109/10/-	£109/10/-
South Metropolitan Gas Co. Ord. (£100)	£128/10/-	£130/10/-
,, 6% Irred. Pref. (£100)	£149/10/-	£149/10/-
,, 4% Pref. (Irred.) (£100)	£108/10/-	£108/10/-
,, Perpetual 3% Deb. (£100)	£90/10/-	£90/10/-
,, 5% Red. Deb. 1950-60 (£100)	£115/10/-	£115/10/-
Staveley Coal & Iron Co., Ltd. Ord.		45/7½
Stevenson & Howell, Ltd. 6½% Cum. Pref.	26/3	26/3
Triplex Safety Glass Co., Ltd. Ord. (10/-)	76/3	70/-
Unilever, Ltd. Ord.	29/4½	29/4½
,, 7% Cum. Pref.	29/9	29/9
United Glass Bottle Manufacturers, Ltd. Ord.	41/-	41/-
,, 7½% Cum. Pref.	33/-	33/-
United Molasses Co., Ltd Ord. (6/8)	18/9	18/9
,, 6% Cum. Pref.	23/9	23/9
United Premier Oil & Cake Co., Ltd. Ord. (5/-)	6/9	6/9
,, 7% Cum. Pref.	23/9	23/9
,, 6% Deb. Red. (£100)	£101	£101

From Week to Week

THE BRITISH ASSOCIATION will meet at Blackpool next year, from September 9 to September 16, and will visit Nottingham in 1937, Cambridge in 1938, and Dundee in 1939. An invitation to Belfast has been accepted, but the date of this visit has not yet been fixed.

FURTHER INDUSTRIAL DEVELOPMENTS are foreshadowed on the Liverpool Corporation's Speke estate. Beck, Keller and Co. (England), Ltd., have informed the finance and general purposes committee of the council that they desire to purchase two acres of land there for the purpose of erecting a factory. The cost of the land is £400 an acre, tenable on a 999-year lease at a peppercorn rent. The company has a factory in Edge Lane, Liverpool, at present for the manufacture of synthetic resin, and it is understood that the erection of the new factory would entail removal from Edge Lane.

THE CORNISH INDUSTRIES FAIR has been a great success and it has evidently displayed to Cornish people as well as visitors not only the immense variety of industry carried on, but also the importance and world-wide fame of some sections of it. The president is Sir Edward Nicholl, president of the Federated Chambers of Commerce, and its vice-presidents are Lord Vivian, Lord Seaton and Sir Arthur Quiller Couch. There were some good examples of "sun burn" bricks made up in fireplaces in great variety, and samples of sand for concrete and road surfacing. There was also an attractive display of a new high aluminium fire brick which is being placed on the market and for which a great demand is anticipated.

A PROSPECTUS TO BE ISSUED by a new Scots company known as the Scotia Iron and Chemical Co., Ltd., which was to take over the Langloan Iron Works at Coatbridge, and some 1,200 acres of land comprising various estates in the Airdrie and New Monkland districts for shale mining, has been withheld until a settlement has been reached in the Italo-Abyssinian dispute. It was intended to obtain the raw material in Airdrie for the manufacture of pig-iron, cement, tar and oil and work was to have been started early this month. Officials hoped to absorb a large number of the Coatbridge and Airdrie unemployed. It has been learned at the office of the Glasgow agents of the company that the issue of stock would be held up indefinitely as a result of the probable far-reaching effect of the Abyssinian dispute. It is understood, however, from an authoritative source, that as soon as a satisfactory decision is reached in this matter the new company will immediately commence operations.

THE STEAMER "ASHANTIAN" (4,917 tons net), the first vessel which the United Africa Co., Ltd., of London and Liverpool, has had built for trade between Liverpool, the Continent and West African ports, left the Mersey on August 29. She is the first of a fleet of seven vessels being built for the company for passenger and cargo service. The vessel has a deep tank for the carriage of palm oil in bulk, aft of the engine room.

AN INTERNATIONAL FOUNDRY CONGRESS will take place in Brussels from September 20 to 25, under the auspices of the International Committee of the Technical Foundry Associations. The following countries will be represented: France, Holland, Italy, Roumania, Spain, Denmark, Great Britain, U.S.A., Germany, Poland, Czechoslovakia and Luxemburg. The congress will discuss many important technical problems.

THE SECOND ANNUAL CONFERENCE of the Institute of Vitreous Enamellers will take place in London on September 27, 28, and 29. The Institute is holding a banquet and dance, in the Edward VII Rooms, Hotel Victoria, Northumberland Avenue, London, W.C.2, to inaugurate the conference. Mr. Frank Hodges, J.P., and Mr. S. C. E. Lloyd of Stewarts and Lloyds, Ltd., will attend the banquet and will be supported by prominent leaders of industry, commerce, and scientific societies closely connected with the enamelling industry. An intresting programme has been arranged for the entertainment and instruction of members and their friends.

PARTICULARLY SATISFACTORY CONDITIONS continue in the iron and steel trade in the Glasgow district. Recent important additions have been made to order books of big engineering companies. Home business is still the main feature, and this has kept all the steelworks well employed throughout the holiday months. There are at present 14 furnaces in blast in the West of Scotland—four on basic, four on hematite, and six on foundry pig-iron—and practically all the output is being absorbed locally. It is several years since rollers met with such encouraging demand. Recent contracts include many on the structural side. Babcock and Wilcox have received orders for electric travelling cranes from the Crown Agents for the Colonies, and William Bain and Co., Coatbridge, have steelwork orders from the same source. War Office requirements include steel boxes from Mechans, Ltd., Scotstoun, punching and shearing machines from James Bennie and Sons, Govan, and bridgework from Sir William Arrol and Co., Ltd., who are also to supply the Air Ministry and Admiralty with machinery and electric cranes respectively.

Company News

Cooper, McDougall and Robertson.—The payment is announced of 2½ per cent., less tax, on September 30, the same as last year.

Associated Portland Cement Manufacturers.—An interim dividend of 5 per cent., less tax, is being paid on the £3,500,000 ordinary stock. This is the first time the company has made an interim payment on this stock. A dividend of 10 per cent. was paid for 1934 compared with 7 per cent. the previous two years.

Cerebos, Ltd.—An interim distribution of 10 per cent., less tax, is announced. For 1933-34, a dividend of 40 per cent., tax free, was paid, compared with 30 per cent. the previous year. It was announced at the annual meeting last March that the directors proposed altering the date of the end of the company's year to December 31. As this would mean the next accounts would cover a period of thirteen months, they hoped to compensate shareholders for waiting this extra time by paying an interim dividend in September.

United Indigo and Chemical Co.—A net profit of £8,720 is reported for the year to June 30 last. This compares with £8,825 the previous year. The ordinary dividend is maintained at 5 per cent. This absorbs £2,625, and after £4,500 for the preference dividend there remains £16,780 to be carried forward, against £15,185 brought in.

British Portland Cement Manufacturers, Ltd.—An interim dividend of 7½ per cent., less tax, has been declared on the £1,680,000 ordinary capital. For many years the half-yearly payment has been repeated at 5 per cent., and from 1927 to 1933 the final dividends were 10 per cent. Last year, however, the final payment was raised to 12½ per cent., less tax, making 17½ per cent. for the full year.

Imperial Chemical Industries, Ltd.—The directors have declared as at September 14 in respect of the trading year ending December 31, 1935, an interim dividend of 2½ per cent. actual on the issued ordinary capital of the company. This dividend will be payable (less income tax at 4s. 2d. in the pound, being United Kingdom income tax at four shillings and sixpence in the pound less Dominion income tax relief at 4d. in the pound) on November 1, 1935, to shareholders on the register on September 14, 1935.

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